Minimalism and the syntax-phonology interface

Heather Newell & Craig Sailor

Nov 2023

1 Introduction

Although the literature on the syntax-phonology interface is vast, there have been almost no attempts within this literature to explicitly apply Minimalist reasoning in pursuit of a general theory. This chapter is an attempt to address this lacuna, rather than an exhaustive survey of existing work on the interface.

In what follows, we attempt to characterize, in broadest strokes, what a Minimalist theory of the syntax-phonology interface should look like, emphasizing a set of design principles that we take to be essential for such a theory. In particular, we adopt the basic Minimalist principles that the architecture of grammar is modular and "feed-forward" (i.e., it is organized in an inverted Y-model), and that these distinct modules necessarily work with discrete, mutually unintelligible alphabets (i.e., they obey Strict Modularity). When combined with the methodological and ontological economy that comes with the Strong Minimalist Thesis, these premises – often mentioned, but rarely applied rigorously – impose strict conditions on what might qualify as a Minimalist interface theory. Weighed against this metric, we argue, even mainstream approaches to the interface come up short.

We begin by discussing these premises in more detail, before showing how various existing theories are incompatible with them. We cast a particularly critical eye on what is currently the dominant theory of the syntax-phonology interface – namely Prosodic Phonology (especially as implemented within Optimality Theory) – and argue that it does not meet the Minimalist standard as we define it. Our treatment of this previous literature is rather narrow, however, and readers seeking a traditional overview chapter would be better served elsewhere.[1] Rather, the bulk of the forthcoming discussion is dedicated to demonstrating the viability of Minimalist alternatives with a collection of disparate case studies on syntax-phonology interface phenomena, including ellipsis in Taiwanese, hiatus resolution in complex words in Ojibwe, and domains of tonal phenomena in Xitsonga and Kuria.

2 Starting premises

The literature explicitly applying Minimalist reasoning to the phonological side of the syntax-phonology interface is quite small.[2] This might stem from the position in Chomsky (2014) that Minimalism aims to explain restrictions on syntactic structure and its viability at the interfaces, but that, at least for PF, interface considerations might override Minimalist design. Notably, Chomsky sends the reader to Bromberger and Halle's (1989) *Why phonology is different* for discussion of what is

[1] For particularly comprehensive surveys of the syntax-phonology interface literature, see Elordieta (2008) and Scheer (2011), along with Selkirk (2011), Elfner (2018), Bennett and Elfner (2019), and Newell (in progress).

[2] See the references in §2.4 (especially Samuels 2009, 2011), the papers in Grohmann (2009), as well as Dobashi (2020) and Samuels (2024). We also return to a brief discussion of the lack of work in Minimalist phonology in §5.

important to the final stages of the PF interface. Although phonology is undoubtedly different from syntax in its alphabet, representations, and computation (see also Neeleman and van de Koot 2006, Heinz and Idsardi 2013, Idsardi 2018), it does not follow that the workings of the phonological module ought to be excluded from Minimalist inquiry—questions of economy, locality, and third factors are all phonologically relevant, for example (see Samuels 2011).

With this in mind, we begin by describing and briefly defending our starting assumptions, each of which is fundamentally Minimalist, either in letter or in spirit. We adopt these premises for the remainder of the chapter, and do not attempt to justify them further.

As we will see, adopting these premises has significant consequences for the analysis of many phenomena—specifically, it demands reanalysis of a considerable portion of the patterns that compose the empirical base of the literature on Prosodic Phonology, intonation, external sandhi, cyclic phonology, etc. Obviously, we cannot hope to undertake such comprehensive reanalysis here. What we can do is sketch how to proceed from here, taking it for granted that a Minimalist theory of the syntax-phonology interface is a necessary and desirable goal, and thus justifies the effort such reanalysis will require.

The premises we adopt are the following, described in turn below:

(1) a. Strict Modularity
    b. A feed-forward Y-model of grammatical architecture
    c. Late Insertion of Vocabulary Items
    d. Derivation by phase

Note that (1a-c) predate Minimalism, but remain core tenets of the program. In addition to these concrete premises, we also adopt the general methodological heuristic (presumably common to all the chapters in this volume) sometimes referred to as the *Minimalist Critique*: in the quest for simplicity and conceptual necessity, if a component of the theory is not essential, it should be eliminated (e.g. by reduction to some other, necessary component). Elimination of theory-internal redundancy follows as an immediate consequence of this heuristic, and will play a role in some of our reasoning below.

2.1 Strict Modularity

A cornerstone of the Cognitive Revolution is the proposal that the human mind has a modular architecture (Chomsky 1965, 1980, Fodor 1983, 2000, Jackendoff 1997, 2002, among many others; see Scheer 2011:§586 for an overview). A *module* is a domain-specific cognitive system dedicated to carrying out a single narrowly-construed computation. As summarized in Segal (1996:145), a module takes input (formulated in an alphabet or vocabulary specific to that module), performs its computation quickly, automatically, and without interruption, and outputs the result (which then requires translation if it is to be used as input for another module; see below). In the context of the language faculty, the number and nature of the modules involved is debated (see Scheer 2011:§622 for an overview, and Curtiss 2013 for extensive supporting evidence), but there is general agreement that at least (morpho)syntax and phonology each have modular status, exhibiting the properties described above.

Two prototypical properties of cognitive modules are *Domain Specificity* and *Encapsulation*.[3] Domain Specificity refers to the property that each module can only understand its own proprietary alphabet (a set of symbols, representations, etc.); one module cannot understand the alpha-

[3]Since Fodor's (1983) original proposal, a debate has arisen regarding which of these two properties more essentially characterizes modules: for Domain Specificity, see Hirschfeld and Gelman (1994) and Coltheart (1999); for Encapsulation, see Gerrans (2002) and Clarke (2021).

bet of another.[4] Encapsulation refers to the property that modular computation is bounded by its own input, which is fixed for each iteration; once it has begun, a module's computation is shielded from visibility to or interference from other systems, as well as from separate computations/outputs within the same module.

As implemented in the linguistic modules, Domain Specificity dictates that the computation referred to as the Narrow Syntax (NS) may read and write only terms from the syntactic alphabet (formal features, categories, phrases, etc.), whereas the computation that we can call the Narrow Phonology (NΦ) may read and write only terms from the phonological alphabet (distinctive features, segments, X-slots, etc.). Indeed, the claim that syntax is phonology-free goes back to the earliest days of the generative enterprise (Zwicky 1969; see also Zwicky and Pullum 1986, inter alia), and follows straightforwardly if Domain Specificity renders the syntactic module incapable of interpreting elements of the phonological alphabet.[5] Concretely, a linguistic theory could be said to violate Domain Specificity if it allows or requires an operation from one module to read or write any term from another module's alphabet. A hypothetical NS operation violating Domain Specificity would be, for example, a phi-probe that could only be valued by goals with [+bilabial] onsets. Conversely, such a process on the NΦ side would be e.g. a final-devoicing rule that only applies to case-licensing heads.

Encapsulation in a linguistic context ensures that no new information can be added to or removed from either the NS or NΦ computation once it has begun: derivations are bounded by their own input, and they do not become visible to other modules until a cycle of computation is complete (see discussion of *translation* below). Under Minimalism, this modular property of input-boundedness goes by the name *Inclusiveness* (Chomsky 1995:228; see Scheer 2011:§648). As applied to NS, Inclusiveness prohibits, among other things, the addition of binding indices to nominals, assuming that such indices are not inherent, and the need for them could only arise mid-derivation to ensure convergence in e.g. a binding configuration. More generally, this property can be thought to rule out "lookahead" in derivations, since the needs or outcomes of parallel or future cycles of computation cannot influence the current computation's input.[6]

There is some overlap in the restrictiveness imposed by Domain Specificity and Encapsulation. For example, if information from Module A is illegible to Module B by Domain Specificity, then it follows that Module B could not be affected mid-computation by information from Module A, vitiating the effects of Encapsulation in this context. This is because Domain Specificity is fundamentally a restriction on the type of input (*qua* a set of symbols) that a given module can work with, whereas Encapsulation is a restriction on when and how such input can be considered by the module. The relevance of Encapsulation (by any name) to NΦ has seemingly received very little attention in the literature (but see Blaho 2008:7, Iosad 2017: ch. 2, and Newell and Sailor 2022). In the discussion that follows, we largely set aside Encapsulation, and focus on the boundary conditions imposed by Domain Specificity.

Given the preceding discussion, then, the question immediately arises: how can the workings

[4]This precludes the architecture proposed in Arregi and Nevins (2012:§1.2.1), involving an array of sequentially-ordered postsyntactic "modules" which are maximally similar to one another (by design: *ibid.*:§7.3), up to and including working with identical alphabets. If Domain Specificity is a characteristic property of cognitive modules, then the postsyntactic systems described in Arregi and Nevins (2012) do not qualify as distinct modules for this reason.

[5]Note that Domain Specificity entails the existence of a logical counterpart of phonology-free syntax, namely syntax-free phonology: just as the phonological alphabet is illegible to syntax, so should the syntactic alphabet be illegible to phonology. To the extent that this entailment is discussed at all in the literature, it is usually regarded as being false *prima facie* (Zwicky 1969:411, Miller et al. 1997:68, among others), owing to the feed-forward design of grammar; however, see Scheer (2012:§61) and Breit (2019:17).

[6]There is tension between this property and the interface-driven, "derive-and-crash" derivational system that is widely thought to underpin Minimalist syntax, as lookahead effects can be achieved by brute force without any looking ahead, so to speak. See Preminger (2018) for critical remarks of the latter.

of one module ever be visible to another, given Domain Specificity? If modules are only able to read and write their own proprietary alphabet, then there must be some means by which one module's output can be converted into a format that is legible to another; without this, the output of syntax would have no way of being passed to phonology, for example, and syntactic derivations would never be externalized. The answer is that there must be a mechanism of intermodular *translation* (sometimes referred to as *transduction*), which converts one module's output into an alphabet that another module can then take as its input (see Scheer 2011:§649 for extensive discussion and references).

In Prosodic Phonology, this translation procedure is referred to as *mapping*: syntactic constituents are mapped onto various constituents of the Prosodic Hierarchy (see §3). However, the outcome of mapping in Prosodic Phonology is determined by a number of rules and/or constraints that are context-dependent (rather than being a strict translation of its input); as such, mapping is computational in character. This conflicts with claims in both the linguistic literature and the general cognitive science literature that translation is formally distinct from computation (see Fodor 1983:41, Reiss 2007:§2.3-§4, Hale and Reiss 2008:§5.1.2, Scheer 2012:§160, Scheer 2020, and references therein).[7] A candidate for a non-computational alternative is Vocabulary Insertion, an operation that, unlike mapping, has independent justification (see especially Scheer 2020).

It is important to note that, as a general hypothesis, Strict Modularity is an all-or-nothing proposition; there is no room for gradience (i.e., a theory that only partially respects it). Take the property of Domain Specificity, for example: either each computation works only with its own proprietary vocabulary, or not. In other words, "obeys Domain Specificity" is not a gradable predicate.

Among all of the premises we adopt here, then, Strict Modularity is by far the most restrictive, and therefore likely to be the most controversial. See §2.5 below for some discussion.

2.2 The feed-forward Y-model design

We also assume the traditional (inverted) Y-model architecture of the grammar, whose origins can be traced back to Chomsky (1965: ch. 1). The "feed forward" nature of this model means that information is passed between the modules only in one direction: for example, the syntax provides input to the phonology (indirectly, via translation), but the reverse is ruled out (but see Scheer 2016 for a possible qualification involving phonological information above the melodic tier). Note that while this model of grammar respects Strict Modularity, it is not a consequence of Strict Modularity: other modular architectures are logically possible (see e.g. the Parallel Architecture of Jackendoff 1997, 2002). In other words, the Y-model must be justified on grounds at least partly independent of Strict Modularity, though we leave this aside here (but see Irurtzun 2009 for some justification of a feed-forward model and general arguments against Parallel Architecture).

2.3 Late insertion of Vocabulary Items

We also adopt a realizational approach to morphology rooted in late insertion: phonological information is entirely absent from the items manipulated by the syntactic computation, and is not added until a given cycle has undergone Transfer, and the Vocabulary Insertion operation applies.

[7] To briefly summarize the argument in Scheer (2012:§169), extended in Scheer (2020): if translation involves computation, then translation has the status of a module by definition; however, if translation has modular status, then it grossly violates Domain Specificity. This is because, to perform even its most basic task, it must be capable of reading one module's alphabet and writing another. This paradox is avoided if translation does not involve any computation, but rather simply involves symbol conversion via a lookup table, as argued in the references above. This militates against one of the cornerstones of mainstream Prosodic Phonology, namely computational mapping; for additional challenges, see §3.

We adopt most of the standard assumptions from Distributed Morphology about how Vocabulary Insertion works (see Embick 2015: ch. 4 for an overview), though see below for some discussion (and Akkuş 2024 for detailed treatment).

2.4 Derivation by phase and domain delimiters

We assume that the NS computation is cyclic and derivational, along the lines of Uriagereka (1999) and Chomsky (2001) (but see below for qualifications). Phase Theory is generally thought of purely as a constraint on syntactic derivations; however, when combined with the preceding architectural assumptions, it should be clear that bottom-up cyclic Spell-Out also has significant consequences for what comes "downstream", especially the phonology. Specifically, cyclic Spell-Out ensures that the input to NΦ is not just a complete syntactic representation for an entire sentence (i.e., the root node and all it dominates); rather, the input to NΦ is parceled out into phase-sized *chunks*, to use Scheer's (2012:§99) term. The phonology receives these chunks piecemeal, and operates on each one successively as it arrives (via translation). As such, the phonology is utterly dependent on syntax to define the size of the chunks it computes.[8] We therefore expect to see phonological consequences of derivation by phase—for example, phonological operations which are restricted to working on phase-sized strings.[9] This is exactly what we find, as we discuss further below (and see Marvin 2002, Newell 2008, Pak 2008, Samuels 2009: ch. 5, Samuels 2011, Scheer 2012:§307, and references therein).

Prosodic Phonology is concerned with (among other things) phonological processes that apply within *domains* at and above the Prosodic Word level.[10] A pivotal question facing this literature (one which goes back a very long way: see Part I of Scheer 2011 for a comprehensive history) lies in identifying the means by which these domains are defined—a quintessential interface problem. Proposals range from the insertion of boundary markers at certain morphosyntactic junctures in order to delimit domains (as in SPE: Chomsky and Halle 1968), to the mapping of syntactic constituents onto prosodic constituents which themselves serve as the domains (as in Prosodic Hierarchy-based approaches: Selkirk 1986). We discuss such approaches in more detail in §3, below; we mention them here simply because phase theory offers a straightforward and independently (i.e., syntactically) motivated solution to this domain-delimiting question: if syntax already requires the derivation to be broken up into chunks of varying sizes, then perhaps phonological domains are just an epiphenomenon of this. Thus, to the extent that phonological domains correspond to syntactic phases, the need for a distinct domain-defining mechanism (mapping, etc.) can be eliminated from the grammar (see references cited in the previous paragraph)—clearly a desirable result for a Minimalist theory of the interface. We therefore adopt this assumption in the discussion to follow, recognizing that it is ultimately an empirical question that remains to be answered.

Note that most implementations of Phase Theory include a version of the Phase Impenetrability

[8] To the extent that phasehood is a property of particular heads (*qua* List 1 items: see below), then phonology is dependent on both the syntax and the lexicon for chunk definition. We leave this detail aside (but see D'Alessandro and Scheer 2015 for relevant discussion).

[9] What precisely constitutes a 'phase-sized string' – and, indeed, what precisely constitutes a phase – is still a live issue in the literature (see Fernández-Serrano 2024, as well as the entirety of Part IV of Grohmann and Leivada 2024). We mostly leave this aside, stating our assumptions about e.g. phasal categories where necessary.

[10] Prosodic Words may be smaller or larger than the units occasionally assumed to constitute (morphosyntactic) 'words'. A theory that includes word-internal phases (such as DM) will allow for phase-based domain formation inside of words. Even in this kind of theory, however, the word-internal domains formed in the mapping to the phonology are Prosodic Words rather than entities lower in the Prosodic Hierarchy (e.g. feet, syllables, rhymes, etc.). Additionally, as we will see below in §4.2-§4.4, morphemes outside of word-sized phases may *glom* onto an adjacent domain (Myler 2017), allowing for an explanation of the clearly demonstrated fact that what we consider to be 'words' do not consistently correlate with any single category of syntactic constituent.

Condition (PIC), which states that structures become frozen and inaccessible to further syntactic operations once they have undergone Spell-Out. Some authors have further proposed that the PIC also applies in the NΦ as well as in the NS (Lowenstamm 2014 and D'Alessandro and Scheer 2015, among others). Although the existence of a syntactic PIC will not play any significant role in the coming discussion, it will be crucial for us that a phonological PIC does not exist (see e.g. §4.2.1). Given the arguments in Embick (2014) and Newell (2017a) that the PIC does not hold for (at least) phonological derivations, we therefore include the non-existence of a phonological PIC among our initial premises.

2.5 Summary

The four premises in (1) are taken to underlie a Minimalist point of view with regard to the investigation of the Syntax-Phonology interface. Syntactic cycles determine what is sent to phonology. There is a translation process that transforms those cyclic chunks of abstract syntactic representations into phonological strings. Phonological operations then operate over those strings, but may make no reference directly to the syntax, nor may the syntax interpret or reference the output of those phonological operations.

Some of these premises are widely implemented in current work (e.g. derivation by phase), while others – particularly Strict Modularity – are not, and one can readily imagine why. Strict Modularity in particular is likely to be seen by some readers as a bridge too far: the constraints it places on the space of possible interface theories will likely be unacceptable for some (e.g. Bennett et al. 2019, E. Elfner p.c.). We accept this. Like our other premises, Strict Modularity is a hypothesis: it may be true or false, and readers are free to assume the latter (though we are not aware of any convincing evidence of its falsity). Those who do are unlikely to be convinced by much of the coming discussion. However, it also bears mentioning that, unlike our other other premises, Strict Modularity is a hypothesis embedded within a general theory of cognition, and thus enjoys support from a range of work outside of linguistics (from philosophy of mind, e.g. Fodor 1983, to evolutionary psychology, e.g. Cosmides and Tooby 1994, etc.). Moreover, from a philosophy of science perspective, we ought to adopt the most restrictive set of premises that can still produce descriptively- and explanitorily-adequate theories. One of our goals in the coming discussion is to provide such theories, or – where we are unable to do so – to provide prototypes for the development of such theories.

In §4, we will see some of the analytical consequences of adopting the above premises, which we illustrate with a collection of case studies. First, though, a more detailed discussion of the Prosodic Hierarchy and its motivation within a theory of the interface is warranted.

3 Constituency-based interface theories and their competitors

Many discussions of the syntax-phonology interface that engage seriously with phonological phenomena begin (and end) with Prosodic Phonology, the collection of theories intended to deal with phonological phenomena at and above the word level—roughly, those whose domains of application seem to be directly influenced by syntax.

For a handbook chapter on the syntax-phonology interface, this one is atypical in its treatment of Prosodic Phonology. Rather than surveying the considerable literature on this topic,[11] our discussion of Prosodic Phonology is instead rather brief, and mostly critical. This is because, as we argue below, mainstream theories of the syntax-phonology interface do not meet the Strictly-Modular

[11] For more traditional comprehensive surveys of the Prosodic Phonology literature, see e.g. Elordieta (2008), Selkirk (2011), Wagner (2015), Elfner (2018) and Bennett and Elfner (2019).

standard we laid out above.[12]

To structure the discussion, we divide theories of Prosodic Phonology according to whether they make crucial reference to *constituency*—either syntactic or phonological. The most influential theories rely on constituency; yet, as we argue below, any phonological theory with this property will run afoul of the premises we laid out above (especially Strict Modularity and/or the injunction against inter-modular redundancy). Non-constituency-based theories fare better in this respect, but are conversely much less popular.

3.1 Constituency-based approaches

Almost all theories of prosodic domains over the past 40 years have relied on constituency in some form, and come in roughly two flavors: *Direct Syntax* approaches[13] vs. *Indirect Reference* approaches. What distinguishes the two is the nature of the constituents involved: whereas Direct Syntax allows NΦ to refer directly to syntactic constituency (and c-command relations, branchingness, etc.), Indirect Reference only permits NΦ to reference the constituents of the Prosodic Hierarchy, a collection of objects proposed to be phonological (Selkirk 1984).

Direct Syntax approaches (Kaisse 1985, Odden 1987, 1990, and more recently Seidl 2001, Pak 2008, and Samuels 2009) are rightly criticized for being anti-modular: Domain Specificity (§2.1) must be abandoned if Direct Syntax is adopted. To preserve the modular divide between syntax and phonology, Indirect Reference was developed (Selkirk 1986): as part of the regular inter-modular translation procedure, syntactic constituents are mapped onto broadly isomorphic phonological constituents defined by the Prosodic Hierarchy (Selkirk 1986, Nespor and Vogel 1986). The constituents[14] of the Prosodic Hierarchy relevant to the phonology-syntax interface include (but are not always limited to) Prosodic Word, Prosodic Phrase (and later the Major and Minor Prosodic Phrases), Clitic Group (controversial), Intonational Phrase, and Utterance. As phonological objects, these constituents can be freely referenced by phonological rules without flouting Domain Specificity (but see Scheer 2008 for arguments that prosodic constituents are not truly phonological objects). Moreover, this mapping procedure is assumed to be imperfect, leading to non-isomorphism between syntactic constituents and their prosodic counterparts; this predicts that prosodic phenomena ought to show the effects of such non-isomorphism, a prediction that Selkirk (1986, inter alia) takes to be correct (see §3.3).

Despite the fact that the Prosodic Hierarchy was proposed as a Modularity-respecting competitor of Direct Syntax, the rise of Optimality Theory (OT) saw that founding principle all but

[12] The vast majority of Modularity-violating interface theories in the literature are intended, fundamentally, as theories of phonology, albeit ones requiring some syntactic alphabet to leak through (in the form of sisterhood relations, constituency, categories, etc.). This is likely due to the lasting influence of the *Principle of Phonology-Free Syntax* (Zwicky 1969, Zwicky and Pullum 1986), which is rarely questioned. There are exceptions to this, however: see e.g. the Contiguity Theory of Richards (2010, 2016), which places certain kinds of phonological information (e.g. metrical structure) in the narrow syntax, triggering operations there; see also Kayne (2016:§15-§19), who suggests that all phonological concatenation might be the product of Merge. These syntactic theories violate Domain Specificity just as the phonological theories we discuss here do, but we do not treat the former any further here.

[13] The term *Direct Reference* is sometimes used for this family of approaches as well (for obvious reasons), but see Scheer (2012:§20) for possible confusion arising from this term. For that reason, we use *Direct Syntax* here. Note also that, as Pak (2008:51) and Elordieta (2008:225) point out, there are Direct Syntax analyses that define phonological domains based on syntactic notions other than constituency *per se* (e.g. c-command), as in Kaisse (1985). Nevertheless, such analyses do still rely on syntactic constituency in some fashion (e.g. in defining the notion of "edge", which one of the c-commanding members must occupy: see the Branch Condition of Kaisse 1985:175, for instance). We therefore treat Direct Syntax approaches as constituency-based.

[14] Syntacticians will not recognize these objects as constituents in any familiar sense of the term: for example, they violate the basic phrase-structural property of Endocentricity, in that they are not projections of anything. See Neeleman and van de Koot (2006), Pak (2008), Samuels (2009) and Scheer (2011:§406) for discussion.

abandoned: it is now commonplace to find OT analyses that require simultaneous evaluation of both prosodic constituency and syntactic (and even semantic) information, thereby obliterating the modular divide that motivated the turn toward Indirect Reference in the first place (Scheer 2011:§525, Newell 2018).

Specifically, OT-based implementations of Prosodic Phonology introduced various interface constraints (WRAP: Truckenbrodt 1999; ALIGN: McCarthy and Prince 1993; MATCH: Selkirk 2009, 2011) to achieve the mapping (*qua* translation) from syntax to phonology. These constraints are tacitly (and sometimes explicitly) taken to maintain the Indirect Reference standard that was introduced in the 80s; however, in most cases, such constraints in fact involve direct reference to (or evaluation alongside) syntactic information, in clear violation of Strict Modularity. Indeed, this fact has recently been acknowledged even by traditional proponents of these constraints. For instance, Bermúdez-Otero (2012) notes the modularity-violating nature of Alignment constraints (but argues in support of them nonetheless), whereas Elordieta and Selkirk (2022) and Lee and Selkirk (2022) propose a formal separation of the subgrammar responsible for evaluating interface constraints from the one responsible for evaluating strictly phonological (NΦ) constraints, going as far as to refer to these subgrammars as distinct *modules*. The former, however, does not qualify as a module in any standard sense of the term. As Lee and Selkirk (2022: 371) admit, it "necessarily exploits a mixed syntactic and phonological vocabulary", in violation of Domain Specificity.

As an illustration of the problem, consider a typical definition for one of the popular MATCH family of interface constraints (Elfner 2018:6):

(2) MATCH-PHRASE
For every syntactic phrase (XP) in the syntactic representation that exhaustively dominates a set of one or more terminal nodes α, there must be a prosodic domain in the phonological representation that exhaustively dominates all and only the phonological exponents of the terminal nodes in α.

Plainly, this constraint references syntactic and phonological information simultaneously: it ensures construction of prosodic constituents by comparing sets of syntactic dominance relations to sets of phonological exponents.

The problem is further compounded in traditional OT-based approaches (i.e., those that do not draw the above "modular" distinction between interface constraints and purely phonological constraints). They do not bar interface constraints (e.g. MATCH, ALIGN) from being ranked in the constraint hierarchy alongside constraints that reference purely phonological information (e.g. *LOW, ONSET, OCP). Consider the following tableau from a popular OT textbook (Kager 1999:113), in which an interface constraint (ALIGN-R, which aligns the right edge of a particular morphosyntactic constituent with that of a syllable) is ranked among purely phonological constraints (e.g. *COMPLEX, which constrains complex codas within syllables):

(3) *Simultaneous ranking of interface and phonological constraints (Kager 1999:113)*

Input: /ark-ark/		ALIGN-R	*COMPLEX	DEP-IO	NO-CODA
a.	ar.gark^{h}		*!		**
b. ☞	ar.ga.rɨk^{h}			*	**
c.	ar.gar.gɨ	*!		*	**
d.	a.rɨ.ga.rɨk^{h}			**!	*
e.	a.rɨ.ga.rɨ.gɨ	*!		***	

By erasing the modular divide separating NS from NΦ – both in general constraint rankings, as in (3), and in the definition of the constraints themselves, as in (2) – most OT-based implementations of Prosodic Phonology represent a radical departure from the original guiding principles that motivated the development of Indirect Reference.[15] Indeed, they represent a return to Direct Syntax (Scheer 2011:§525), which the founders of Indirect Reference approaches rightly condemned for being anti-modular.

Thus, we conclude that the clear majority of constituency-based approaches to Prosodic Phonology – both classical Direct Syntax, as well as its resuscitation in OT implementations of the Prosodic Hierarchy – are incompatible with Strict Modularity. As such, they are incompatible with a Minimalist approach to the syntax-phonology interface.

3.2 Non-constituency-based alternatives

A number of criticisms of the Prosodic Hierarchy (independent of those arising from OT-based implementations, as discussed above) have recently led to the development of alternatives. For example, Neeleman and van de Koot (2006) argue at length that phonological representations in fact show none of the telltale signs of tree-like hierarchical structures, and that endowing the phonology with the ability to build and/or manipulate them leads to simultaneous under- and over-generation. They conclude that all phonological representations must be entirely flat, and thus not based on constituency as the Prosodic Hierarchy is (see also Raimy 2000 and Idsardi and Raimy 2013). A related argument is raised by Samuels (2009:100; 254): Merge is the only structure-building operation, but the constituents of the Prosodic Hierarchy are clearly not the product of Merge; thus, generating the Prosodic Hierarchy requires endowing the phonology with its own structure-generating mechanism (*mapping*, in Prosodic Hierarchy terms). Applying the Minimalist Critique (§2), this is an intolerable architectural redundancy. Given Neeleman and van de Koot's (2006) conclusions that phonology is flat, the phonological hierarchy-generating mechanism can – and therefore must – be done away with.

Moreover, as mentioned previously, Scheer (2008) argues that the Prosodic Hierarchy is intrinsically anti-modular, because its constituents are not truly phonological objects in any familiar sense. For example, no constituent of the Prosodic Hierarchy reliably associates with fortition or lenition, nor directly triggers voicing, palatalization, or any other assimilatory operation. Furthermore, prosodic constituents allow external sandhi processes to either breach or respect their boundaries without any clear phonological motivation for which processes might be sensitive to which domain delimiters. In short, the constituents of the Prosodic Hierarchy exhibit none of the properties

[15] For an OT-based implementation of Prosodic Phonology that is truly modular, see Sande et al. (2020), discussed below in §4.3.

of typical phonological objects (nor do they exhibit properties of syntactic constituents: see fn. 14).

Ironically, these criticisms were among those originally motivating the turn toward the Prosodic Hierarchy, and away from early interface approaches which did not rely on constituency. The most influential among these non-constituency-based approaches was that of Chomsky and Halle (1968), whose theory of the interface involved the insertion of diacritic symbols, #, at major morphosyntactic junctures during the translation procedure. Importantly, this boundary-based approach of SPE was entirely flat on the phonological side, trading strictly in linear sequences of symbols (including #) rather than constituents. Beginning in the 1980s, early proponents of the Prosodic Hierarchy criticized # for being phonological in name only, arguing that it lacked the usual hallmarks of phonological objects (see above); however, in this regard the Prosodic Hierarchy seems to fare no better than #, as we just mentioned (and again see Scheer 2008).

Of all these (and other) criticisms of the Prosodic Hierarchy that can be found in the literature, none take aim at the empirical coverage of that theory. Indeed, there is no denying that Prosodic Hierarchy-based approaches to the syntax-phonology interface have led to the analysis of a tremendous range of phenomena. Note, though, that empirical coverage alone is not a compelling reason to maintain a theory in the face of alternatives, for the reasons given in Chomsky (1964:53) and much subsequent work motivating the distinction among levels of adequacy in linguistic theories. Indeed, even poor theories – specifically, those that seriously over-generate – can enjoy broad empirical coverage. Thus, while the Prosodic Hierarchy's ability to fit the data remains uncontested, this property alone is not a strong defense against alternative theories.

The question now arises: is there an alternative approach to the interface that is compatible with our premises? Given that the representations it produces will necessarily be phonological, such a theory could not directly reference syntactic constituents (or categories, etc.); however, it could plausibly reference the edges of *strings* corresponding to spelled-out cycles passed from the syntax (via translation). If some symbol were inserted at these edges, then phonological rules could freely reference those devices; this would give the rough appearance of phonological sensitivity to syntactic constituency, but without actually allowing phonology to have any access to the syntactic alphabet whatsoever. Crucially, though, the edge-marking device in question must itself have independent status as a phonological object; if its sole function is to mark edges, then it is simply a diacritic, and thus subject to all the drawbacks of the SPE # marker just mentioned. What, then, could such a device be?

A promising candidate – one we explore in more depth in §4.2.3 – is *empty syllabic space*: an empty CV unit, mora, or syllable.[16] This idea grows out of work in CVCV Phonology, an extension of Government Phonology (Lowenstamm 1996, Scheer 2004). CVCV Phonology holds that phonology is strictly flat and linear; it neither builds nor interprets tree-like hierarchical structures, consistent with Neeleman and van de Koot's (2006) observations described above. Under the CVCV-based approach to the interface proposed in Scheer (2004, 2012) and D'Alessandro and Scheer (2015), insertion of empty CV units at important derivational junctures (e.g. phases) can capture boundary effects without recourse to a diacritic like #. Crucially, each component of the theory is intrinsically phonological. In particular, CV units are independently-necessary objects in the phonological alphabet, and are canonically associated with a host of phonological processes (fortition, lengthening, blocking, stress, etc.), unlike prosodic constituents or #.[17] In other words, this CVCV-based

[16] See Scheer (2016) on why only syllabic space, and not melody, is a potential domain delimiter.

[17] Scheer (2012:§160) proposes that the insertion of syllabic space (a CV unit) at the left edge of phases is accomplished via Vocabulary Insertion. This requires a departure from how Vocabulary Insertion is traditionally conceived: Scheer's approach involves insertion of exponents/List 2 items that are not the translation of any morphosyntactic feature bundle, but rather are lexical reflexes of the Spell-Out mechanism itself. In the case studies discussed below in §4, we will instead assume that these CV units are inserted via the phonological computation rather than at Vocabulary Insertion. Although the distinction between these two options is non-trivial, we leave it to future work to decide

approach to the interface avoids all of the modular shortcomings of both the Prosodic Hierarchy and SPE-style boundary insertion (see especially Scheer 2012:§188), and thus qualifies as a flavor of Indirect Reference; however, unlike the Prosodic Hierarchy, its phonological mechanisms make no reference to constituency of any kind, and its domain delimiters make independently-motivated phonological predictions. As a result, to the extent that such an approach is successful, it would render the Prosodic Hierarchy superfluous.

When combined with a phase-based derivation, the CVCV approach is able to capture domain-like effects arising at the left edge of a cycle (see the next subsection, and §4.2.3). D'Alessandro and Scheer (2015) develop this idea further, proposing to essentially parameterize insertion of CV units on a phase-by-phase basis, thereby allowing for both intra- and inter-language variation regarding which phases exhibit phonological domain effects. A recent reply by Bonet et al. (2019) counters that this approach lacks the empirical coverage of the Prosodic Hierarchy and thus is not a licit replacement for it; however, as mentioned above, empirical coverage is a notoriously weak metric for the comparison of theories. Bonet et al. (2019) offer no arguments against the theoretical machinery proposed in D'Alessandro and Scheer (2015), as far as we can see (in particular, against the cyclic insertion of CVs as domain delimiters in lieu of the PH, which we discuss in detail in §4). Though we leave the details of this debate aside, we take it as a specific example of how a Minimalist approach to the syntax-phonology interface is a growing concern within the field. Questions of modularity and domain definition are once again pushing the field to refine its tools.

3.3 Phonological evidence for phases? The (non-)isomorphism question

Let us return for a moment to cyclic Spell-Out domains, or phases. In the literature, diagnostics for phasehood are mostly limited to morphosyntactic and semantic (scope/reconstruction) evidence (Gallego 2010, Abels 2012, van Urk 2020, among others). As mentioned in §2.4, the phonological reflexes of phases are the subject of a growing literature on the interface, but these phonological-domain effects are not generally taken as evidence for phasal domains in their own right.[18] That is, evidence for phonological domains without accompanying syntactic evidence is not taken to be a reliable indicator of phasehood in the literature (see Wagner 2015 on phonology as evidence for syntax more generally). We believe this is a mistake, and suspect it is due to two factors: one sociological, and one theoretical.

The sociological obstacle is simply a lack of communication between phonologists and syntacticians, reflected in the surprising shortage of collaborative work between the two.[19] If one accepts the hypothesis that cyclicity in syntax automatically imposes cyclicity on phonology (see the previous section), and that the sole cyclic interface operation is phase-based Spell-Out/Transfer, then it follows that phonological domains should be just as informative about phasehood as evidence from, say, movement. More cross-modular collaborative work (like this chapter) can help to bring parallel evidence for cycles in the morphosyntax and the phonology to the fore.

which of them is better able to account for the well-documented distribution of empty CV units at the left edge of phonological cycles.

[18] Ironically, some of the earliest evidence for successive-cyclic movement (now understood as a by-product of the phase-based derivation) came from certain morphophonological patterns, for example *wanna*-contraction (Chomsky and Lasnik 1977). See Thoms and Sailor (2018) for similar cliticization-based evidence for movement through the *v*P phase edge.

[19] We can think of distressingly few prominent examples of phonologist-syntactician collaborations, particularly given that interface questions have been a going concern since the earliest days of the generative enterprise. Some examples include Chomsky and Halle (1968), Bye and Svenonius (2012), D'Alessandro and Scheer (2015), Cheng and Downing (2016), Arnhold et al. (2018), Bennett et al. (2016, 2019), Fábregas and Krämer (2020), and Clemens and Bickmore (2020). It is noteworthy that most examples we can think of are quite recent—a cause for optimism, perhaps.

There are other, more theory-based reasons that phonology tends not to be a popular source for evidence of phasehood. One such reason might be due to Kiparsky (1982), who argues that post-lexical phonology – i.e., phonology across words – is non-cyclic. The outsized influence of that work likely turned many phonologists away from looking for phonological reflexes of successive-cyclicity.

Another reason is that phonological domains are seen as unreliable evidence for phasal domains under the logic of the Prosodic Hierarchy (Selkirk 1984, 2011, Nespor and Vogel 1986), since one of its core tenets is that phonological domains and syntactic structures are routinely non-isomorphic (see e.g. Wagner 2015:§2.3 for an overview).[20] However, a clarification on this front is in order. Even properly specifying the domains to be compared for (non-)isomorphism is challenging: it requires a sophisticated understanding of both the syntax and phonology of any language(s) under consideration. Here the problem from the previous paragraph rears its head again: achieving an adequately sophisticated understanding along these lines would seem to require just the sort of collaborative work between (morpho)phonologists and (morpho)syntacticians which is sadly underrepresented in the field.

Earlier work in this area faces similar problems: syntactic theory has advanced sufficiently since the era when the foundations of Prosodic Phonology were first developed (the mid-1980s to the mid-1990s) that the structures posited then would no longer be considered valid under our present understanding of syntax, thus seriously confounding the original arguments for non-isomorphism. For instance, virtually all putative examples of non-isomorphism from Nespor and Vogel's (1986) seminal work on the topic are based on phenomena involving the attachment of adjuncts, relative clauses, etc.—structures that would receive radically different syntactic analyses today (see Bennett and Elfner 2019: fn. 3 for a similar point). As such, the original empirical arguments for non-isomorphism should be looked upon with skepticism until the underlying syntactic analyses can be updated and reassessed. (For additional arguments against the premise that syntactic and phonological domains are non-isomorphic, see Marantz 1997, Pak 2008:§2.2.1, Samuels 2009:§5.4.1, Scheer 2011:§416, Wagner 2015, and Myler 2017, among others.)

We do not mean to suggest that phonological processes are incapable of disrupting isomorphism; rather, we follow the references just cited in suspecting that the conditions under which such disruptions arise form natural phonological classes that can be generalized over, and thus do not motivate a theory of the interface in which a mechanism for generating non-isomorphisms is 'baked in', which it is with mainstream Prosodic Phonology (where non-isomorphisms simply reflect violations of MATCH constraints, e.g. with eurythmic mismatches, or violations of ALIGN constraints, e.g. with mismatches due to strict layering).

Examples of what we mean here can be found in some of the case studies we discuss in the next section: when phonological items (e.g. a light syllable or a floating tone) cannot be licitly parsed in the phasal domain in which they are spelled out, they may be realized non-locally (see also Ahn and Sailor 2019 and Ahn et al. to appear). In both cases, it is the inability of the item to stand alone phonologically that forces what appears to be non-isomorphic behavior, rather than any readjustment of the domains themselves.

More generally, the goal of the next section is to demonstrate how various challenging interface phenomena can be reanalyzed without appealing to the Prosodic Hierarchy or other modularity-violating objects and operations. Our hope is that if successful reanalysis along such lines is possible for the small but diverse collection of case studies we discuss below, then it should be possible across the board, meaning a Minimalist theory of the syntax-phonology interface is achievable.

[20] Note that the advent of the Prosodic Hierarchy predates that of Phase Theory, but the argument holds: if phonological domains are routinely non-isomorphic with syntactic structure (which we dispute), then the former could not be specified by phases alone.

4 Case studies in syntax-phonology interface phenomena

This section describes several phenomena that each involve some interaction between syntax and phonology, albeit in very different ways; moreover, each has received a traditional analysis that conflicts with our Minimalist premises, warranting their reanalysis. Our goal is to show that each phenomenon can in fact be reanalyzed in a way that is consistent with the premises we laid out above; namely, in a way that respects Strict Modularity, and does not require inter-modular redundancy, etc. Clearly, this sample of phenomena cannot fully represent all of the diverse cases that have been analyzed in the large and important body of work on this interface. Rather, our hope is that our reanalysis of these four narrow case studies will help to demonstrate the plausibility of a more general research program—a Minimalist approach to syntax-phonology interface phenomena.

4.1 Case study 1: Ellipsis

Our first case study involves ellipsis, a phenomenon widely regarded as involving "deletion at PF" of a syntactically-defined constituent.[21] Any theory of the syntax-phonology interface has to explain how a given syntactic object can remain phonologically unrealized, even though under normal circumstances it is associated with Vocabulary Items that contain phonologically-overt material. Our challenge lies in finding an explanation that respects core Minimalist premises such as Strict Modularity.

We begin the discussion of ellipsis with a brief background on its treatment in the literature, in particular its status as involving "deletion at PF". After describing the fundamental challenges to this approach posed by Strict Modularity, we lay out alternatives that are consistent with the Minimalist premises we laid out above.

4.1.1 Ellipsis is not "deletion at PF"

Ellipsis refers to one particular sort of *interpretable silence* in natural language (among many others) in which a syntactic constituent may go unpronounced when it appears in a certain syntactic configuration and its meaning is recoverable from the discourse (see Merchant 2018 for an overview). Since Ross (1969), evidence has accrued suggesting that ellipsis sites are more or less regular, internally-structured syntactic constituents, albeit ones that are somehow rendered silent (and are subjected to various interpretational well-formedness conditions, left aside entirely here; see references in Merchant 2018).

The dominant formalization of this idea arose from the work of Jason Merchant (2001, 2004, 2008, inter alia), whose [E] feature delegates most of the tasks of generating the salient properties of ellipsis – its silence, its interpretive effects, etc. – to the interfaces. Aside from syntactic licensing (determined simply by the set of heads able to bear [E]),[22] [E] is conceived as a set of instructions for LF and PF. This now widely-held view of ellipsis – that its syntax is essentially mundane, and that its silence is imposed post-syntactically – is commonly summarized with the following expression: ellipsis is "deletion at PF". Despite the popularity of this assumption, however, few attempts have been made to identify the PF mechanism(s) responsible for the silence of the ellipsis site.

While Merchant is clear that this question is orthogonal to his main interests (i.e., the syntax and semantics of ellipsis), he does provide some suggestions. For example, in describing clausal

[21] The content of this subsection is drawn from Sailor (in progress).

[22] We discuss only cases of *head-licensed* ellipsis here, i.e. what have traditionally been described as NP ellipsis, *v*P ellipsis, and TP ellipsis (e.g. sluicing): see Hankamer (2018) for recent discussion of this classification, though the observation that certain types of ellipsis are head-licensed goes back to Bresnan (1976), Sag (1976), and Zagona (1982), and was given a uniform analysis in Lobeck (1995).

(TP) ellipsis contexts, Merchant (2004) characterizes the silencing mechanism triggered by [E] as (emphasis ours):

> "...a familiar kind of **morphologically triggered syncope**: here the morphological trigger is [E] and the syncopated element is TP...The non-pronunciation is entirely controlled by the actual phonology (that component which takes a PF structure as its input), in ways familiar from studies of morphologically determined syncope phenomena, here merely applied to a larger prosodic unit" (Merchant 2004:671).

While these suggestions for how to achieve "deletion at PF" are clearly preliminary, they have also been highly influential, with much of the subsequent ellipsis literature either tacitly assuming something along these lines, or developing it explicitly (recent examples of the latter include Griffiths 2019, An 2019, Erschler 2022, among many others).

This family of PF-deletion approaches (including those sketched in Merchant 2001:60 and Merchant 2008:134) is incompatible with Strict Modularity, and thus a non-starter for a Minimalist theory of the interface. For example, the above quote includes a suggestion that syncope – a phonological rule whose structural description is defined over phonological strings – could be applied to a prosodic constituent corresponding to an entire clause; however, the notion 'clause' (and/or the categories TP/CP) is not part of the phonological alphabet. Thus, no phonological rule could make reference to such an object in order to delete it (or, indeed, to wrap it in a phonological phrase first and then delete that; see §3, above). More generally, phonological processes simply do not work with strings of anything approaching the size of a clause.[23] As Scheer (2011:616) puts it, "No phonological theory is suited for the manipulation of this kind of object, which phonologists look at like an ant looks at a jumbo jet."

Even overlooking such details, it becomes clear that any PF-deletion approach will fail on grounds of Modularity, because a more general problem looms. If we take "deletion" to mean "removal of phonological material",[24] then whatever rule we are proposing must necessarily be a *phonological* rule: manipulation of the phonological alphabet can only happen within that module (Domain Specificity). However, there is no phonologically-formulable operation that can apply to syntactic constituents of potentially unbounded size. To demonstrate this, we sketch a few hypothetical attempts below, and show how each fails in turn.

Perhaps the most commonly-held view of how "deletion at PF" ought to be implemented appeals to the Prosodic Hierarchy: for example, the ellipsis site is wrapped in a prosodic constituent that the phonology can then operate on directly, silencing/deleting it (following the instructions it receives from [E], for instance): see Merchant (2001:60) for such a proposal, and An (2007: ch. 5), Bruening (2015), and Sato and Maeda (2019), among others, for related PH-based analyses of ellipsis phenomena. Given the discussion above in §3, such an option is ruled out in frameworks such as CVCV Phonology, along with the rest of the Prosodic Hierarchy: under Minimalist premises (and see also Neeleman and van de Koot 2006), the NΦ computation cannot be in the tree-building business, particularly when that hierarchy essentially duplicates work from another module (but without the logical underpinnings, given that the constituents of the Prosodic Hierarchy violate Endocentricity; see §3). If a syntactically-defined ellipsis site cannot be mapped onto a phonological

[23] At this point the reader might wonder about intonation, which (i) seems phonological, and (ii) seems to work on clause-sized strings. Though we cannot discuss intonation in any detail here, we can at least say that intonation clearly does not engage in deletion, and thus is not responsible for the silence of ellipsis (but see Tancredi 1992 on the ellipsis-deaccenting connection).

[24] We could of course take "deletion" to mean "removal of syntactic structure (which then never makes it to Vocabulary Insertion for exponence)"; this is the tack taken in Murphy and Müller (2022), for instance, resuscitating some of the earliest generative ideas about ellipsis. Along similar lines is Banerjee (2020), who argues that ellipsis leads to obliteration (terminal removal) in the morphological component prior to Vocabulary Insertion. We return to some of these issues below.

object of equal size, then there is no single object for the phonology to syncopate (or otherwise render silent). The only other alternative along these lines – adopting a Direct Syntax-like approach in which a phonological rule can make direct reference to e.g. syntactic category – is straightforwardly ruled out under Domain Specificity.

We can imagine alternatives, however. For instance, one might concede that the silence of ellipsis is not the effect of a single application of some phonological rule – one-fell-swoop deletion, as it were – but rather the iterated application of a rule applying to much smaller objects than (the prosodic constituent corresponding to) an entire syntactic constituent. That is, perhaps there is successive syncope (e.g.) of phonological material below the prosodic word level, until the entire ellipsis site has been exhausted. While this could potentially be stated in such a way as to avoid reference to the Prosodic Hierarchy, it would surely fall short on other grounds. First, such a rule would need instructions – e.g., where to start and where to end – which do not reference any symbols outside the phonological alphabet. Given that ellipsis is licensed in the syntax (and the size of the ellipsis site defined as a consequence of such licensing), that would seem to require these instructions to be passed to the phonology from the syntax. However, down this path another Domain Specificity violation is lurking: such an approach would require the syntax to mark terminals with "delete me" diacritics only legible within the phonology.[25] Simply put, diacritics violate Domain Specificity by definition, since their job is to smuggle bits of one module's alphabet into another: see Scheer (2012:§95) for extensive discussion. Yet again, a "deletion at PF" approach to the silence of ellipsis is ruled out by standard Minimalist assumptions.

Challenges for the "deletion at PF" approach posed by the theory – specifically, by Strict Modularity – are compounded by empirical arguments as well. For example, as Sailor (2022) argues in detail, the silence of ellipsis is relevant for allomorph selection.[26] We briefly review the argument below; but, if correct, the challenge this poses should be clear: if allomorph selection occurs post-syntactically, then the silence of ellipsis has to arise no later than at Vocabulary Insertion as well (see below). This straightforwardly precludes a "deletion at PF" account: by definition, any phonological deletion rule would be unable to apply until after Vocabulary Insertion has taken place. In other words, a "deletion at PF" account predicts that the silence of ellipsis should be irrelevant for allomorph selection, since phonological deletion would have to wait until allomorphy had already been determined, and the relevant forms inserted. If Sailor's argument is sound, this prediction is disconfirmed.

The argument comes from the interaction of ellipsis and tone sandhi in Taiwanese (Southern Min / Min Nan), a lexical tone language. Taiwanese (and its close relative, Xiamen) has a complex tone sandhi system that has received a great deal of attention in the phonological literature. Very roughly, a syllable bearing an underlying lexical ("citation") tone undergoes a predictable tonal alternation if it occurs in what appears to be a non-XP-final position.[27] An example is below, adapted

[25] The reader may wonder whether this problem could be avoided if we assume that ellipsis can apply "for free", leaving the job of filtering out ill-formed ellipses to some other part of grammar (an admittedly Minimalist approach). This is the proposal of Ott and Struckmeier (2018), who imply that over-application of freely-applying ellipsis will lead to unrecoverable deletions, which they imply are ruled out on grounds of discourse infelicity (i.e., the grammar generates such over-applications, but they are ruled out on Gricean grounds). Aside from the fact that this kind of approach fails to take account of all the findings relating to ellipsis licensing since Bresnan (1976), it also cannot capture derivational interactions between ellipsis and other syntactic processes of the sort discussed below without additional stipulation.

[26] To our knowledge, this claim was first made by Kornfeld and Saab (2004), in their discussion of Spanish determiner allomorphy in the context of NP ellipsis.

[27] If tone sandhi is a phonological process, then this characterization of its domain of application is incompatible with our premises: a phonological rule cannot make direct reference to syntactic information such as "XP", assuming Domain Specificity. However, as Sailor (2022) argues, tone sandhi in Taiwanese is the product of allomorphy (i.e. Vocabulary Insertion), not of phonology (i.e. NΦ). Regardless, "non-XP-final" is an oversimplification in any case, since adjunction introduces exceptions: see Chen (2000: ch. 10) for extensive discussion. While we can imagine an MP-friendly analysis of Taiwanese tone sandhi that accords with the premises we adopt here (taking seriously the

from Simpson and Wu (2002:74); syllables in **bold** have undergone tone sandhi:[28]

(4) **na**-**si** **A**-sin **m**-khi, **A**-hui **ma** **b**-**e** khi.
if A-Sin NEG-go A-Hui also NEG-IMPF go
'If A-Sin doesn't go, then A-Hui also won't be going.'

The non-bold syllables arise in what appear to be XP-final configurations, and thus fail to undergo tone sandhi, in line with the rough structural description given above for the Taiwanese tone sandhi "rule". However, as Sailor argues (building on earlier work by Tsay and Myers 1996), this system is highly unlikely to be the product of any phonological rule(s). Experimental results from Zhang et al. (2006) and Chen et al. (2010) show that Taiwanese tone sandhi is unproductive: in brief, speakers fail to apply sandhi in nonce-word environments, suggesting that their grammars lack the generalized rules necessary to produce the expected patterns. Given that tone sandhi is normally exceptionless in Taiwanese, these authors conclude that it must be the product of allomorphy, instead: each tone-bearing morpheme has a citation-tone allomorph and a sandhi-tone allomorph (which explains why speakers overwhelmingly fail to apply tone sandhi of any kind in nonce-word conditions: novel items cannot have associated allomorphs).

This sets the stage for a look at how ellipsis and this system of allomorphy interact. Sailor (2022) shows that ellipsis seems to create new XP-final configurations as far as this sandhi "rule" is concerned. He shows this with data from both predicate ellipsis (5) and nominal ellipsis (6):

(5) a. **A**-Ying chang **b**-**o** **khi** **hak**-hau, **tan**-**si** **A**-Ha **u** **khi** **hak**-hau.
A-Ying yesterday NEG-PERF go school but A-Ha PERF go school
'A-Ying didn't go to school yesterday, but A-Ha did go to school.'

b. **A**-Ying chang **b**-**o** **khi** **hak**-hau, **tan**-**si** **A**-Ha { u / ***u** } ~~[khi hak-hau]~~.
A-Ying yesterday NEG-PERF go school but A-Ha PERF
'A-Ying didn't go to school yesterday, but A-Ha did.'

(6) a. **Chi**-Beng **beh** **sann** **pun** chhe, **A**-Ying **beh** **si** **pun** chhe.
Chi-Beng buy three CL books, A-Ying buy four CL book
'Chi-Beng bought three books, and A-Ying bought four books.'

b. **Chi**-Beng **beh** **sann** **pun** chhe, **A**-Ying **beh** **si** { pun / ***pun** } ~~[chhe]~~.
Chi-Beng buy three CL books, A-Ying buy four CL
'Chi-Beng bought three books, and A-Ying bought four.'

In both cases, the material stranded adjacent to the ellipsis site – i.e., the perfective marker *u* in (5), and the classifier *pun* in (6) – cannot undergo tone sandhi; they surface with their citation tone instead, as though they were in XP-final position. Crucially, this contrasts with the unelided representations in the (a) examples above, in which both *u* and *pun* undergo tone sandhi obligatorily.

Taking all these facts together, Sailor concludes that the silence of ellipsis is directly relevant for allomorph selection, meaning it cannot be the product of the application of a rule in NΦ; this silence must arise before or during Vocabulary Insertion, where allomorphy is determined. In other words, ellipsis cannot be "deletion at PF". The question immediately arises: what is responsible for the silence of ellipsis, if not phonological deletion? In what remains of this subsection, we weigh

arguments Chen 1987:143 and Tsay and Myers 1996:399 against a purely prosodic approach), we leave this for future work, focusing only on its interaction with ellipsis here.

[28] Taiwanese and Xiamen tone sandhi involves circular chain shift, a type of counterfeeding opacity that is notoriously difficult to capture in both rule-based and OT-style frameworks. Neither this property nor the actual tones involved (citation or sandhi) bear on the present discussion, which is only concerned with where and when sandhi takes place. See Chen (1987, 2000) and Zhang et al. (2006), among others, for further details on the phenomenon and its relevance for phonological theory.

Abbreviations used in this section: CL = classifier; IMPF = imperfective; NEG = negative marker; PERF = perfective.

the analytical options against our premises in §2.

4.1.2 Modularity-friendly alternatives to the silence of ellipsis

We discuss two potential sources for the silence of ellipsis, both of which fare better than "deletion at PF" with respect to the premises we laid out in §2, but only one of which is fully compatible with Strict Modularity.

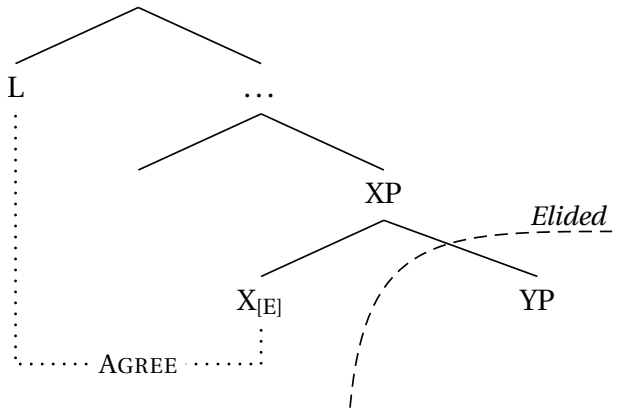
The first possibility – to our knowledge, initially proposed in Wilder (1997:§6.5) and developed in Bartos (2000, 2001) – is that the silence of ellipsis reflects non-application of Vocabulary Insertion to the contents of the ellipsis site. Under this view, ellipsis somehow instructs Vocabulary Insertion to bypass the terminals that comprise the ellipsis site (and/or the constituents that dominate them, if non-terminal insertion is allowed; see below, as well as Akkuş 2024 and Svenonius 2024 for discussion), meaning there is never any phonological material within the ellipsis site to undergo deletion in the first place. We refer to this as the Non-Insertion Hypothesis (NIH). It has been explicitly developed in much work by Andrés Saab (see Kornfeld and Saab 2004, Saab 2008, Saab and Lipták 2016, and Saab 2022, i.a.), while a growing number of other works have adopted it without much comment (e.g. Aelbrecht 2010, Merchant 2015:207, among others; but see Murphy 2016 and Sailor 2022 for some discussion of non-insertion in the context of ellipsis).

One immediate advantage of the NIH over "deletion at PF" is that no special phonological deletion operation is required (nor, indeed, is any component of the Prosodic Hierarchy): it makes use only of the independently-needed machinery of Vocabulary Insertion. Likewise, it offers a straightforward explanation of the facts reviewed above from Sailor (2022): plainly, the silence of ellipsis can affect allomorphy if it arises in the same component of the grammar where allomorphy is implemented.

Whether the NIH meets the standard of Strict Modularity is a separate question, and the answer appears to be negative. Although there is more than one way to implement the NIH – see Saab (2022) for discussion of two variants, the details of which are mostly left aside here – they all face a seemingly-insurmountable problem from Strict Modularity. Specifically, any implementation of the NIH would seem to require NS to be capable of telling Vocabulary Insertion when it should not apply, based on the outcome of syntactic ellipsis licensing. Given that Vocabulary Insertion is not a syntactic operation, however, this poses a problem: the syntactic computation should have no 'knowledge' of operations located outside its modular walls, and thus no means of instructing Vocabulary Insertion when not to apply (whether by the addition of diacritic "don't insert here" features across the ellipsis site's terminals as in Saab 2008, or by the deletion of "insert here" features across the ellipsis site's terminals as in Saab 2022; in either case, the notion *insert* is not an item of the syntactic alphabet).

A Modularity-compatible alternative to the NIH is proposed in Sailor (in progress). This alternative also takes Vocabulary Insertion as the general mechanism responsible for the silence of ellipsis, but it differs from the NIH in a significant way: rather than reflecting the non-application of Vocabulary Insertion, this approach takes the silence of ellipsis to reflect the insertion of a null exponent at the ellipsis site. To see how this works, recall the discussion above reviewing Aelbrecht's (2010) approach to ellipsis licensing: ellipsis is properly licensed *iff* an [E]-bearing head X undergoes an Agree relation with a higher ellipsis-licensing head L:

(7) *Ellipsis licensing (Aelbrecht 2010:§3.2.3)*



Whereas Aelbrecht's proposal takes this Agree relation to result in non-insertion or "deletion at PF" of X's complement YP, an alternative is that XP itself is rendered silent, following non-terminal insertion of a null exponent of XP during Vocabulary Insertion. Under this approach, the ellipsis site is still a regular constituent in the syntax, and its silence is simply a lexical (List 2) property.

Before going into further detail, the following independently-motivated assumptions are necessary for this proposal to work: Vocabulary Insertion proceeds inside-out/bottom-up as usual (see Kalin and Weisser 2024 for an overview), but it must be able to operate on non-terminal nodes, overwriting (or "overriding") its own previous output when a node is reached with a more suitable matching lexical entry than what was inserted lower in the structure.[29] While this is a departure from the standard DM view, non-terminal Vocabulary Insertion is supported by a rapidly-growing literature: see Radkevich (2010:§3.1.2) for a DM-based proposal, Baunaz and Lander (2018:§1.3.3.2) for its counterpart within Nanosyntax, and Caha (2018) for a comparison of the two. For concreteness, let us adopt Radkevich's system, summarized in the following principle:

(8) **The Vocabulary Insertion Principle** (Radkevich 2010:62)
The phonological exponent of a Vocabulary Item is inserted at the minimal node dominating all the features for which the exponent is specified.

In brief, for a structure $[_{\alpha P}\ \alpha\ [_{\beta P}\ \beta]]$, insertion at αP rather than at α will arise just in case there is an exponent in List 2 specified for $[\alpha, \beta]$: in such a case, αP is the minimal node dominating both features.

Let us see how this could yield the silence of ellipsis (again see Sailor *in progress* for details). If a language allows ellipsis of YP, this amounts to a statement about that language's Vocabulary / List 2 (setting aside the ellipsis licensor for the moment): namely, that it contains an exponent specified for [E, Y] which is null. According to (8), this exponent will be inserted on the minimal node dominating both the ellipsis feature [E] and the category feature [Y], which is XP in (7). This null exponent and its context of insertion within an Aelbrecht-style licensing configuration are illustrated below:[30]

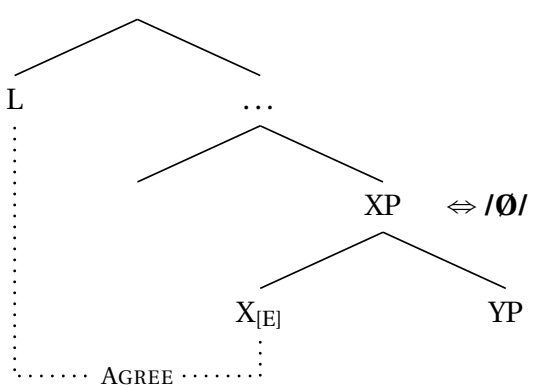
[29] At a glance, such overwriting might seem to violate certain Minimalist principles, e.g. the No Tampering Condition and/or the Phase Impenetrability Condition (see Gallego 2020 for arguments that the No Tampering Condition can be reduced to the PIC, and see Embick 2014 and Newell 2017a for arguments that the PIC itself is epiphenomenal). However, to the extent that such principles hold over computations in general – or syntactic computations in particular – then Vocabulary Insertion is exempt: as an inter-modular translation procedure, Vocabulary Insertion is neither computational in character nor part of the NS proper (see Scheer 2012:§160 and Scheer 2020 for discussion).

[30] Given cyclicity and bottom-up Vocabulary Insertion, it is possible in principle for XP to be targeted for insertion prior to Merge of the ellipsis licensing head L (i.e., if the two are separated by a cyclic domain boundary). This does not pose a challenge for the present proposal, though: since [E] is part of the List 1 entry for X (rather than a property resulting from Agree with L), nothing will prevent insertion of /Ø/ at the point when XP is spelled out. Assuming Vocabulary

(9) Ellipsis as null exponence (Sailor *in progress*)

a. List 2 entry resulting in a silent XP in an ellipsis context:
/Ø/ ⇔ [E, Y]

b.



For example, then, ellipsis of *v*P would involve (in addition to its licensing within the narrow syntax) insertion of /Ø/ on the minimal node dominating the features [E, *v*] (which, following the claims in Aelbrecht 2010:§4.2, would be VoiceP). Essentially, this null exponence approach to the silence of ellipsis is a dramatic instance of portmanteau suppletion: a single exponent realizes features spread across more than one head. A clear advantage of this proposal, then, is that the silencing effect of ellipsis is mundane, requiring no special PF/phonological mechanism beyond what can be justified on grounds independent of ellipsis. Moreover, the inventory of constituents that can be silenced by ellipsis in a given language (again setting aside syntactic licensing) simply corresponds to the inventory of List 2 items that realize [E] in that language, predicting just the sort of variation that we expect based on the Borer-Chomsky Conjecture (and which we see in the distribution of ellipsis types within and across languages).[31] In other words, null allomorphs need not be proposed for every morpheme in the lexicon of a speaker, but only for the set of elidable XPs in their language (e.g. NP, VP, and CP).

What makes this particular case of portmanteau suppletion particularly striking, however, is that insertion of /Ø/ in the above configuration silences much more structure than just the heads bearing the relevant conditioning features: it also silences any YP-internal structures, for example. This is a straightforward consequence of non-terminal insertion, which necessarily involves overwriting of earlier applications of Vocabulary Insertion inside the targeted node as an epiphenomenon (both within DM and Nanosyntax: see references cited above). In practice, though, YP in the above configuration can dominate an arbitrarily-large structure, all the exponents of which are (correctly) overwritten by insertion of /Ø/ at XP.

Under this analysis, the licensing of ellipsis and its characteristic silence are only indirectly related: unlike Aelbrecht's (2010) approach (itself based closely on Merchant 2001, 2004), ellipsis licensing does not cause the resulting silence—neither by instructing Vocabulary Insertion not to apply, nor by instructing PF to delete a constituent somehow (see above). Rather, both the licensing of ellipsis and its silence happen to make use of the same feature, [E]. As such, the two ought to be dissociable: it should in principle be possible to distinguish the syntactic licensing of ellip-

Insertion has no effect on the narrow-syntactic representation (see fn. 29), insertion of /Ø/ would not disrupt Agree between L and X at a later cycle (setting aside the independent question of whether Agree can cross a cyclic domain boundary). See Sailor (in progress) for further discussion.

[31] This would seem to predict that languages could realize [E] with an overt exponent instead, assuming that the relation between a formal feature and its surface form is absolutely arbitrary (i.e., that [E] cannot somehow be universally associated with silent exponence). If Bentzen et al.'s (2013) analysis of surface anaphora in Norwegian and German is correct, then this prediction is in fact confirmed; see Sailor (in progress) for discussion.

sis (as analyzed in Aelbrecht 2010) from the silence of ellipsis,[32] leading to a number of interesting consequences which must be left aside here (again see Sailor, in progress).

4.1.3 Summary

As one case study in the syntax-phonology interface, the foregoing discussion of ellipsis is intended to show how even contemporary, widely-held assumptions – e.g., that ellipsis is "deletion at PF" – can be shown to be incompatible with Minimalist premises (among them Strict Modularity). In this case, the problem arises because the syntax appears to instruct the NΦ to delete a constituent of an arbitrarily-large size, a demand the phonology is simply not equipped to carry out. We argued above (following very recent suggestions in the literature) that the silence of ellipsis is better understood not as the product of a phonological rule, but of Vocabulary Insertion: such a mechanism may freely interpret the output of syntax without violating Domain Specificity, and has the means to effect the characteristic silence of ellipsis without making recourse to elements of the Prosodic Hierarchy.

In the next subsection, we explore a different case study in the syntax-phonology interface—one on the other side of the interface, so to speak, in the form of vowel hiatus resolution. As we will see, this process is directly constrained by the options provided by the syntactic derivation, despite its appearances as a quintessentially phonological operation in nature.

4.2 Case study 2: hiatus resolution in Ojibwe

We turn now to a case study involving vowel hiatus resolution in Ojibwe (Algonquian). We have chosen this phenomenon because it bears all the characteristics that would normally invite a Prosodic Hierarchy (PH)-based analysis in the literature; in particular, it is characterized by apparent non-isomorphisms between the syntactic output vs. the domain that phonology seems to work with (recall that such apparent non-isomorphisms are regarded as *prima facie* arguments for PH-based approaches: §3). Since the PH is incompatible with Minimalist premises (as argued in §3), then apparent non-isomorphisms of this sort must be explained by other means.

After describing the core data involving apparent non-isomorphisms in how hiatus is resolved in Ojibwe in §4.2.1, we sketch the PH-based analysis put forth in Newell and Piggott (2014) in §4.2.2. Then, in §4.2.3, we lay out a competing analysis found in Newell and Scheer (2017) which eschews reference to the PH entirely, and instead relies only on what is already required independently: the cyclic derivation computed in NS; the translation of each output cycle from NS into a phonological string via Vocabulary Insertion; and, finally, a particular phonological object that marks the edge of each resulting string as it is generated (namely, the empty syllabic space, or CV, referenced in §3.2). Thus, to the extent that we can provide a credible alternative analysis that is consistent with the Minimalist agenda we laid out in §2, we will have provided a template for approaching other such interface phenomena in a Minimalist way.

4.2.1 Ojibwe hiatus: basic facts and generalizations

Ojibwe repairs vowel hiatus in one of two ways – either by deletion (10) or by epenthesis (11) – but, interestingly, it can also leave hiatus unresolved (12). The examples below are from Newell and Piggott (2014). Throughout, vowels in hiatus appear in **bold**.[33]

[32] Note, though, that one direction of this dissociation can be ruled out: for insertion of /Ø/, [E] must be present in the derivation, and all instances of [E] must be properly licensed under Agree (see Aelbrecht 2010:§3.2.3 for details). In other words, we do not predict insertion of /Ø/ to be possible in contexts where ellipsis is not formally licensed.

[33] Abbreviations used in this subsection (not already defined above): 1 = 1st person; 2 = 2nd person; 3 = 3rd person; *a* = adjectivizer; CAUS = causative; PL = plural; POSS = possessive; SG = singular; TO.SPKR = directional (toward speaker); *v* = verbalizer.

(10) [name:g]
/nam**e:**-**a**g/
sturgeon-PL
'sturgeons'

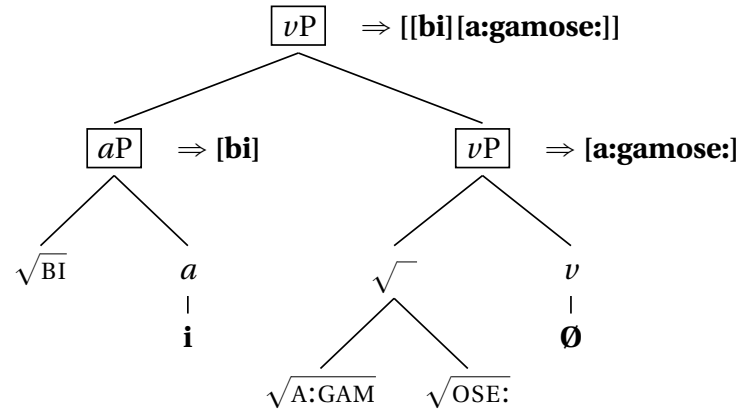
(11) [nidakwe:m]
/n**i**-**a**kwe:-im/
1SG-wife-POSS
'my wife'

(12) [b**ia:**gamose:]
/Ø-b**i**-**i**-**a:**gam-ose:-Ø/
3SG-TO.SPKR-*a*-snowshoe-walk-*v*
'He/She walks here in snowshoes.'

Newell and Piggott (2014) argue that these different hiatus resolution strategies track differences in the underlying syntax of these examples. For instance, they argue that the deletion strategy is only available when the hiatus-inducing vowels undergo Vocabulary Insertion in the same cycle; i.e., they are not separated by a cyclic domain boundary. Thus, the hiatus in (10) is resolved via deletion because the two morphemes responsible for the hiatus occupy the same Spell-Out domain (DP).

Leaving aside the epenthesis strategy for the moment, we turn instead to (12), where hiatus goes unresolved. Newell and Piggott note that /bi-i-/ is a deictic adverbial modifier, adjoined to the *v*P. Crucially, as an adjunct (labeled here *a*P), it is spelled out separately from its host (see Uriagereka 1999, Johnson 2003, Newell 2008, Sato 2009, among others). As a result, hiatus is resolved within the *a*P (by deletion: /b**i**-**i**/ → [bi]), but not across *a*P and *v*P (/b**i**-**a:**gamose:/), since there the hiatus-inducing vowels do not share a cycle (nodes corresponding to cyclic domains are boxed below):

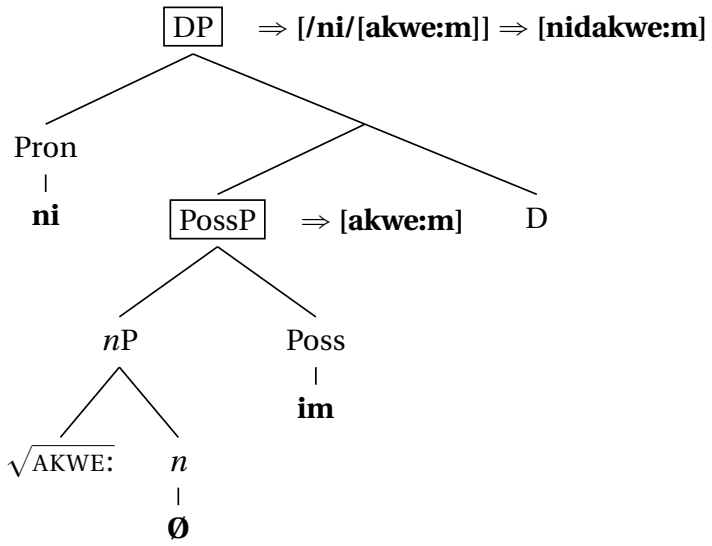
(13)



Thus, VV-sequences that are due to the linearization of separate workspaces remain unresolved in the language, as in (12)-(13). Moreover, for (10) and (12) we see surface isomorphism of syntactic and phonological domains.

Turning to the epenthesis strategy in (11), we see an instance of what is traditionally considered non-isomorphism in the Prosodic Phonology literature: hiatus is resolved between morphemes that are spelled out in separate cycles ([n**i**-**a**kwe:m] → /ni-**d**-akwe:m/), contrary to what we have just seen in (13). The structure of this possessive DP is illustrated below (Newell et al. 2018). The possessor /ni-/ is merged in the Specifier of DP; as such, it is spelled out in a separate cycle from the complement of D (on the widespread assumption that D is a phase head):

(14)



The crucial difference between (13) and (14) – the one responsible for these distinct treatments of hiatus – is that only the latter derivation allows for re-footing of the prefix with the material in its complement. Newell and Piggott (2014) argue that this refooting in Ojibwe is licensed by a kind of cliticization they refer to as Phonological Merger:[34]

(15) Phonological Merger (Newell and Piggott 2014:353)
(X (.....)) → (~~X~~ (X.....))

In brief, Phonological Merger applies to /ni-/ in (14), but not to /bi-/ in (13). Both derivations involve a morpheme that is too small to be footed on its own, namely /ni-/ and /bi-/, which are monomoraic morphemes containing just a single short vowel (after resolution of hiatus in the case of the *a*P); the crucial difference lies in the derivational history leading up to the spell-out of each morpheme. Let us briefly see how this works.

In (14), the domain in which /ni-/ is spelled out (DP) contains a previously-computed cyclic domain (the phase complement of D^0), to which /ni-/ is therefore able to cliticize via (15). Note that this incorporation of /ni-/ can only occur once /ni-/ has undergone a stage of phonological computation: only after failing to construct a foot around this Vocabulary Item will the phonology deem /ni-/ too small to stand on its own, allowing it to find a host in another, locally-computed cycle.[35] This cliticization is what leads to refooting, which in turn leads to hiatus resolution via epenthesis. An example derivation is illustrated below:

(16) a. /akw**e:**-**i**m/ → a.kwe:m → (a.kwe:m) *Deletion, syllabification, footing*
b. /ni-/ → ni → *ni *Syllabification, footing fails*
c. n**i**-(**a**.kwe:m) → (ni.**d**a)(kwe:m) *Phonological Merger, refooting, epenthesis*

The question that arises here is why hiatus should be resolved differently after cliticization (by epenthesis) than it is within a cycle (by deletion). We must consider the timing of syllabification in order to answer this question (see Newell 2016 for a more detailed discussion). In essence, the input to the hiatus resolution operation is different depending on whether it applies within a cycle or after cliticization. Within a cycle, hiatus resolution can occur before syllabification; deletion is the resolution strategy applied to a linearized sequence of unsyllabified vowels. The phonological

[34] Newell and Piggott (2014:353) define Phonological Merger as refooting into another PWd, which we do not assume here (note that the (non-)existence of the Prosodic Hierarchy was orthogonal to their analysis). Direct evidence for feet in Ojibwe comes from the alternating stress patterns of the language, whereas direct evidence for nested PWds is not clearly available.

[35] Ojibwe footing is iambic, constructed from left-to-right (Piggott 1980, 1983).

representation after cliticization, however, is necessarily syllabified. Recall that cliticization is triggered by the inability of the light syllable to project a foot, which cannot be determined prior to syllabification. Once cliticized, the structure that triggers hiatus resolution is necessarily a sequence of syllabified vowels. An onset position is therefore available, giving rise to a distinct phonological process: epenthesis.

This option is unavailable to /bi-/ in (13): when /bi-/ is spelled out, it finds no previously spelled-out material to cliticize to in its complement (inside its phase), and thus has no chance of being refooted. Subsequent Merger of *a*P and *v*P is of no help either. The relevant relation among the cycles involved is one of *containment*: a morpheme can only undergo this cliticization if its cyclic domain contains a potential host. In (13), the *a*P does not contain the *v*P: they form separate command chains (Uriagereka 1999), and are therefore spelled out independently before they are Merged together. The result is that the phonology must employ its general last-resort strategy for any final unfooted/degenerate syllable containing a short vowel: it builds a degenerate foot around /bi-/. This footing bleeds any future potential application of Phonological Merger after linearization of the *a*P and *v*P phases; already-footed material does not need to be 'repaired'.

Note that if this approach is on the right track, it gives us valuable insight into the construction of phonological domains and the visibility of previously spelled-out domains at later steps in a derivation. Specifically, the operation in (15) requires previously spelled-out cycles to be visible to phonological processes under the right structural configuration (containment). In other words, at the spell-out of DP in (14), the entire domain of DP is visible to NΦ. This clearly requires the Phase Impenetrability Condition (Chomsky 2000, 2001) to be inactive in the phonology (see §2.4). If we assume that previously spelled-out domains remain accessible for phonological processes on subsequent cycles, then we have a way to approach the problem seen above in (14). At the spell-out of /ni-/ in [Spec, DP], /akwe:m/ will be visible and available for cliticization.[36] On the other hand, at the spell-out of the *a*P phase in (20), /bi-/ is alone in its cycle: /a:gamose:/ is not within its complement and so is not visible inside the Spell-Out domain of *a*P. Hiatus is therefore not resolved in this derivation, as it is not visible upon spell-out of the morphemes involved.

4.2.2 A Prosodic Hierarchy approach to Ojibwe hiatus resolution

Let us use these facts and generalizations from Ojibwe to start comparing theories of phonological domain-building. Our goal in the remainder of this section will be to evaluate the compatibility of these theories with Minimalist premises such as Strict Modularity and a feed-forward cyclic interface, as described in §2. We will begin in this subsection by considering an analysis of the Ojibwe patterns described above which makes use of traditional phonological domain construction: i.e., the mapping procedure responsible for generating the Prosodic Hierarchy. After weighing this PH-based analysis against our premises and finding it wanting, we will explore and defend an alternative CVCV Phonology analysis in the next subsection.

Looking back at the deletion strategy in (10), we might assume that when a DP is spelled out, it gets mapped to a phonological domain—say, a Prosodic Word (PWd).[37] Then, we could simply assume that hiatus is resolved by deletion within a PWd in Ojibwe:

(17) *Ojibwe vowel hiatus resolved by deletion (Prosodic Hierarchy version)*
[$_{\text{DP}}$ nam**e:**-**a**g] → ($_{\text{PWd}}$ nam**e:a**g) → ($_{\text{PWd}}$ name:g)

[36] See Cheng and Downing (2016) and Dobashi (2020) for a different view on the visibility of syntactic structure in phonology: for them, syntactic structure is directly mapped to prosodic structure in one fell swoop at the end of a derivation, eschewing an appeal to phases altogether.

[37] For the sake of argument, we are setting aside the known problems with mapping phasal domains to prosodic constituents, especially in highly synthetic languages (as in Ojibwe) where there is clearly no match between X^0s/Phonological Words and XPs/Phonological Phrases (Compton and Pittman 2010, among others).

However, things are more complicated for the other two hiatus resolution strategies.

First, consider the epenthesis strategy seen in [nidakwe:m] (11). Let us assume that the derivation of the innermost cycle (PossP/*n*P, which involves deletion) mirrors that of (17):

(18) $[_{\text{PossP}/n\text{P}}$ akw**e:**-**i**m] → ($_{\text{PWd}}$ akw**e:i**m) → ($_{\text{PWd}}$ akwe:m)

Subsequently, /ni-/ must undergo spell-out as part of the edge of DP. We might simply adopt the same basic scenario as in (16) above, but swapping out the well-formedness of feet for that of PWds. That is, we could assume that /ni-/ is too small to project a PWd itself, and must project only a syllable; as such, no prosodic domain would be matched with the DP Spell-Out domain. This would then lead to incorporation of /ni-/ into the PWd following it, in much the same way as we saw previously with Phonological Merger:[38]

(19) *Ojibwe vowel hiatus resolved by epenthesis (Prosodic Hierarchy version)*
ni- ($_{\text{PWd}}$ akwe:m) → ($_{\text{PWd}}$ n**ia**kwe:m) → ($_{\text{PWd}}$ ni**d**akwe:m)

We could see this incorporation as the consequence of a constraint in OT like STRONG-START (Selkirk 2011), which requires that a prosodic domain at a left edge not be lower in the PH than the domain to its right. Thus, a syllable preceding a PWd violates STRONG-START, leading to selection of a candidate in which /ni-/ is part of the same PWd as the stem.

However, if this PH-based derivation is on track, a familiar problem arises: we cannot maintain our assumption that hiatus within the PWd is resolved by deletion, given that the output of (19) includes an epenthetic consonant (cf. (18)). It is clear that the derivational history of the prefix or suffix is what determines the hiatus resolution strategy employed, independently of the prosodic structure attributed to the output.[39]

Turning now to the case of unresolved hiatus seen above in (12), a distinction must clearly be made between the phonological behavior of /bi-/ and /ni-/. Within a MATCH-style Prosodic Hierarchy analysis, this distinction can made in one of two ways: either by appealing to syntactic cycles, or by appealing to the lexical vs. functional nature of the morphemes involved. We discuss each of these options in turn in the remainder of this subsection.

The first analytical option is similar to the derivation discussed above, appealing to the complement vs. adjunct status of the morphemes. Here we must say that an adjunct like /bi-/, despite its monomoraic size, projects a PWd. The structure of /bi-a:gamose:/ would therefore be as follows:

(20) *Ojibwe vowel hiatus left unresolved (Prosodic Hierarchy version)*
($_{\text{PWd}}$ b**i**-) ($_{\text{PWd}}$ **a:**gamose:)

Note that in each of (19) and (20), we have two cycles of phonological interpretation. Somehow, the derivation must be sensitive to whether the phonological material to the right of the prefix originated in the syntactic complement of that prefix. Given Strict Modularity, this information must be obtained derivationally; it cannot be marked on the phonological structure, since *complement* is not an item of the phonological alphabet (by Domain Specificity).

[38] This derivation involving PWds (rather than, say, one in which the prefix is incorporated as part of a larger prosodic constituent such as the Clitic Group) is supported by evidence from stress patterns in the language suggesting that the prefix is footed with the following syllable (see Piggott 1980, 1983 and Newell and Piggott 2014).

[39] This is even clearer in cases of hiatus in inalienable possession constructions (which are syntactically distinct from alienable possession constructions such as those in (14)) as such cases involve hiatus between person prefixes and a following noun that are resolved via deletion (e.g. /ni-o:komis/ → [no:komis] 'my grandmother'). The hiatus resolution strategies in Ojibwe are uncontroversially linked to the syntactic structure in which the relevant morphemes appear, and not to morpheme-specific constraints/diacritics. See Newell and Piggott (2014) for more detailed discussion.

This type of analysis will need an additional tool to account for the distinct resolution strategies within a single cycle, as in (10), and after refooting, as in (11): namely, faithfulness to previously-computed structure (which leads to effects that offer an alternative to the phonological PIC; see §2.4). For this to work, we must assume that undergoing a cycle of NΦ fundamentally alters the vowels inside that cycle, such that they are no longer licit targets for deletion. As proposed in the previous subsection, one possible alteration of this sort might be syllabification: the standard assumption in the literature is that lexical items are not stored with syllabic structure; this structure is added during phonological computation. A vowel that has undergone a full cycle of computation would be structurally different from a vowel that has not yet undergone a full cycle of computation, and phonological rules or constraints simply need to be sensitive to this difference (see Newell 2017b for a detailed analysis of this distinction). In an OT-style analysis, sensitivity to earlier cycles could simply be implemented as a variety of faithfulness, so long as we assume that a cycle of phonological computation renders its output fundamentally distinct from its input.

The second analytical option mentioned above relies not on the adjunct/argument divide, but rather on the lexical/functional divide. In mainstream (PH-based) Prosodic Phonology, patterns like those seen above involving the different behavior of /ni-/ vs. /bi-/ often assume distinct phonologies for functional vs. lexical items (Inkelas and Zec 1993, Selkirk 1972, 1996, Hall 1999, Shih 2018). For instance, whereas /bi-/ contains a lexical root, /ni-/ does not (but see Leu 2015 on the lexical base of functional items). If phonology is sensitive to the lexical vs. functional distinction, then it could simply instruct lexical items to always project a PWd, while functional items will only do so if they are large enough, i.e. bi-moraic or bi-syllabic (Selkirk 1996).

While this sort of approach can easily capture the differing behavior of /ni-/ vs. /bi-/ with respect to hiatus, it also blatantly violates Strict Modularity: the phonology cannot reference terms like *functional* or *lexical*, which, to the extent they have any theoretical status whatsoever (Svenonius 2014), must be items of the syntactic alphabet.[40] Between these two analytical options – either restrict the PIC so that it does not hold for the NΦ computation, or endow the phonological alphabet with the lexical/functional distinction – it should be clear that only the former is compatible with our Minimalist premises in §2.

This subsection has shown that the Ojibwe vowel hiatus pattern is amenable to a PH-based account, but let us now turn to an alternative analysis of the same facts and generalizations that does not violate Strict Modularity.

4.2.3 A modular alternative to Ojibwe hiatus resolution: empty syllabic space

The above analysis of Ojibwe vowel hiatus can account for the facts; however, it appeals to elements of the Prosodic Hierarchy, a device we take to be at odds with basic Minimalist principles (see §3). Recall that the PH is disqualified under our premises because, among other things, it introduces intolerable redundancy into the architecture of grammar: phonology must replicate (at times imperfectly) the hierarchical structures that syntax has already generated. However, the obvious alternative – sidestepping this redundancy by simply letting phonology reference syntax directly (as in Direct Syntax) – is anti-modular, and thus a non-starter for us. An alternative is required.

Recall from §3.2 that insertion of empty syllabic space provides a promising alternative to the Prosodic Hierarchy, especially when viewed through the lens of the Minimalist premises we adopt. Newell and Scheer (2017) offer a CVCV-based analysis of the Ojibwe vowel hiatus facts, outlined below, in the hopes that it demonstrates the general viability of this sort of approach to syntax-phonology interface phenomena. For detailed discussion of CVCV Phonology as a framework, in-

[40] See Newell and Scheer (2021), who derive the phonologically weak nature of so-called functional items from a combination of their underlying phonological representations and the cyclic derivations that they emerge from (cf. Cardinaletti and Starke 1999 on the different syntactic positions of strong vs. weak pronouns).

cluding its relationship with the syntactic derivation, see Scheer (2004, 2012), and D'Alessandro and Scheer (2015).[41]

Before delving into the Ojibwe analysis, let us begin by briefly comparing a hierarchical (i.e. PH-based) vs. linear (i.e. CV-based) account of a particular derivation. Consider a hypothetical language that resolves hiatus via deletion. This language must define the phonological environment within which deletion will apply. Under a PH-based account, prosodic constituents are built via mapping; these could then be referenced by a deletion rule such as the following (stated informally):

(21) **Deletion rule for resolving hiatus (Prosodic Hierarchy version)**
In a sequence V_1V_2, do not realize V_1 *iff* V_1 and V_2 are within the same PWd.

Such a rule would yield patterns of the following sort (in a hypothetical language):

(22) a. [[$_{\text{PWd}}$ d**a**] [$_{\text{PWd}}$ **i**bi]] → d**ai**bi *No hiatus resolution*
b. [$_{\text{PWd}}$ d**a**-**i**bi] → dibi *Hiatus resolved via deletion*

A strictly linear approach to the same set of facts would make no appeal to domains of any sort (PWds or otherwise), but would rely on linear boundary definition instead, using CV units to demarcate said boundaries. Specifically, the phonology might simply insert an empty CV unit at the left edge of the string corresponding to a completed cycle passed to it from the syntax. Such insertion would require no reference to hierarchy of any sort; it would operate strictly linearly, applying to strings, not structures.

With this in place, a deletion rule could be defined simply according to locality on the CV tier (alternatively known as the *X-slot tier* or the *Skeleton*, depending on the details of the Autosegmental Phonology framework assumed; see fn. 41 for brief background on CVCV Phonology). The hypothetical rule in (21) could be restated as follows:

(23) **Deletion rule for resolving hiatus (CVCV Phonology version)**
If two vocalic segments V_1 and V_2 are local on the CV tier, then delete V_1.
(V_1 and V_2 are *local* if no V intervenes.)

This would yield the same result as above. Note the presence of empty CV units (in bold) at the left edge of each putative cyclic domain in (24) (i.e., the chunks previously identified as PWds, where (24a) would correspond to (22a) and (24b) to (22b)).

(24) a.

C	**V**	C	V		**C**	**V**	C	V	C	V	
		|	|					|	|	|	→ da ibi
		d	a					i	b	i	

b.

C	**V**	C	V		C	V	C	V	
		|	|			|	|	→ dibi
		d	a			i	b	i	

In essence, the framework's proposal that the insertion of empty CV units at the left edges of cyclic domains has the effect of disrupting locality between two adjacent Vs just in case they emerge in separate cycles. This ensures that hiatus is resolved *within* a cycle, but not *across* cycles in this

[41] For the reader unfamiliar with CVCV Phonology, the following background should be sufficient to clarify the discussion below: (i) the CV tier consists of strictly alternating sequences of C(onsonant) and V(owel) positions; (ii) empty C positions (those not linked to a segment) are licit without restriction; and (iii) empty V positions must be followed by a full vocalic position (a V linked to a segment) in the following CV unit. This entails that sequences of two empty vocalic positions are disallowed.

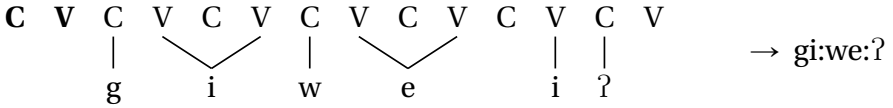
hypothetical language.

Returning to Ojibwe, this sort of approach allows Newell and Scheer (2017) to capture Left-edge/Right-edge asymmetries not discussed in Newell and Piggott (2014). For example, in addition to hiatus being resolved by deletion within a phase, hiatus may be resolved by deletion between a base and any suffix—even those that are arguably outside the phase that contains their base of attachment, as in the following (from Newell and Piggott 2014:333):

(25) nigi:we:ʔa:
[$_{CP}$ ni- [$_{vP}$ [$_{vP}$ gi:w**e:**] **-i**ʔ -a:]]
1SG go.home CAUS 3SG
'I make him go home.'

Here we see a typical 'high' causative, characterized by a causative morpheme introduced outside the internal *v*P phase. Even though the causative suffix is introduced after the internal *v*P undergoes Spell-Out, hiatus is not resolved via epenthesis, contrary to what we expect (see discussion of (18)-(19), above); instead, it is resolved via deletion. Newell and Scheer (2017) propose that this is due to the fact that empty CV units are inserted only at the *left* edges of Spell-Out domains, and not at the right (following independent arguments for the same in Scheer 2004, 2012, among many other works using the CVCV framework). Thus, when /-iʔ/ is linearized to the right of /gi:we:/, no vocalic syllabic space intervenes between the overt vowels; as such, they are in a local relation on the CV tier, and thus the second V is deleted by a rule akin to that defined above in (24):

(26) *Ojibwe vowel hiatus resolved by deletion (CVCV Phonology version)*

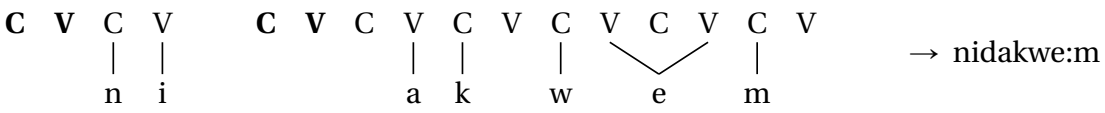


We turn now to the epenthesis resolution strategy we saw above for /nidakwe:m/ in (19), reprinted here without reference to the PH:

(27) ni- akwe:m → n**ia**kwe:m → ni̲dakwe:m

Under a CVCV-based approach to such cases, an empty CV is inserted at the left edge of /akwe:m/ upon spell-out of the *v*P phase. Here, the equivalent of Phonological Merger must apply: *ni-* cannot be footed, as no other overt vowels are introduced in its cycle. The footing algorithm therefore re-applies over the entire string in (28), including the empty CV intervening between *ni-* and *akwe:m*, triggering epenthesis:

(28) *Ojibwe vowel hiatus resolved by epenthesis (CVCV Phonology version)*



The intricacies of the phonological analysis of this epenthesis are left aside here,[42] but what is clear is that the phonological structures in (26) and (28) are distinct. Epenthesis, as well as the non-local nature of the two vowels, bleeds deletion.

The important point for the Minimalist discussion here is that, in linear CVCV derivations, the behavior of extra syllabic space is consistent with predictions of the theory that are independent of

[42] Briefly: in CVCV Phonology, configurations such as this one where a C is preceded by an empty V lead to that C becoming *licensed*, or phonologically strong. Strong C positions trigger epenthesis intervocalically in the CVCV analysis of Ojibwe (see Newell and Scheer 2017 for technical details of CVCV Phonology omitted here).

the questions of Spell-Out domains. The C in which the epenthetic consonant is inserted in (28) is predicted by CVCV Phonology to be a strong position, where consonants undergo fortition or resist lenition processes cross-linguistically (the *Coda Mirror*: Ségéral and Scheer 2008, Scheer and Ziková 2010). As such, it is a predictable candidate for epenthesis. In (26), however, the C position between two overt vowels is in a weak (*governed*) position—one which is again independently argued to be the locus of lenition processes, and whose behavior is well-established independent of questions concerning the interface. In a language that differentiates weak and strong consonant positions, a weak position is less likely to host epenthesis (although epenthesis is not impossible here cross-linguistically).[43]

The final pattern in Ojibwe, where hiatus remains unresolved, is accounted for procedurally in the CVCV framework, just as it was within the Prosodic Hierarchy approach in (20). Since an adjunct (bi-) and its host (a:gamose:) do not enter into a relationship of containment, the two morphemes will never be computed in the same phonological cycle. We forego a discussion of how feet and stress are represented in CVCV Phonology, as this would take us too far afield. It suffices to say that CVCV has the same representational capacity to imbue /bi-/ with a degenerate foot as does standard metrical phonology, which means that the two domains will be linearized, no Phonological Merger will occur, and the initial empty CV preceding *a:gamose:* will be treated as any word-initial CV sequence followed by a vowel is: no repair strategy is be triggered, as the structural description of hiatus is not met.

Crucially, the domain-delimiting items in the CVCV-based approach – namely, Cs and Vs (or syllables, or morae in alternate theories of syllabic structure) – are independently-motivated phonological objects, regardless of one's theory of the interface. The same cannot be said of prosodic constituents. The Prosodic Hierarchy has a single function: to delimit domains of phonological computation. To the extent that the exclusion of the Prosodic Hierarchy from phonological analyses is possible – i.e., if prosodic phenomena can be reanalyzed without reference to the Prosodic Hierarchy – then the Prosodic Hierarchy should be excluded entirely from a Minimalist theory of the syntax-phonology interface (see also Pak 2008 and Samuels 2009). This is another invocation of the Minimalist Critique: if we can do without the PH, then we should.

4.2.4 Summary

In the preceding discussion of vowel hiatus in Ojibwe, we hope to have shown that while a PH-based approach is able to capture the relevant facts, the CVCV alternative captures everything the PH analysis does, and does not require endowing the phonological module with the ability to build and interpret tree-like hierarchical structures. This possible replacement for prosodic constituency essentially represents a return to a boundary "symbol" (cf. # from SPE), albeit one with an irreducibly phonological status in the form of an empty CV unit.

Our summary of the CVCV analysis in Newell and Scheer (2017) demonstrates its general plausibility (and its advantages over the PH-based alternative, when viewed through a Minimalist lens), so we have included it here in the hopes that it might provide a template for future work undertaking a Minimalist approach to the syntax-phonology interface.

[43] Similarly, an approach based in the Prosodic Hierarchy would assert that prosodic constituents are stronger initially and weaker finally, in accordance with the cross-linguistic data. Unlike the CVCV approach, however, there is no independent motivation for this pattern within the Prosodic Hierarchy; it could have just as easily been the opposite, where final position is strong and initial position is weak. (For a refutation of the typological/phonetic motivation for initial strength defended in e.g. Beckman 1997, see Ségéral and Scheer 2008.) Therefore, in addition to causing problems for Modularity, the PH approach lacks independent phonological motivation for its phonological effects, meaning they must be stipulated. (This is true also of the boundary symbols used in SPE and Selkirk's early work: see Scheer 2008 for a discussion of the phonological predictions made by different boundary markers on the market.)

In the next two subsections, we turn to our third and fourth case studies of syntax-phonology interface phenomena, both involving domains of tonal phenomena in Bantu languages. As with the Ojibwe data, we will see that syntax plays a crucial role in producing the observed effects; thus, a Minimalism-compatible analysis (i.e., one not built from elements of the PH) is required. Note that these tonal phenomena appear to cross phrasal boundaries more readily than segmental processes do, allowing us to broaden the scope of the discussion of the interface to larger phonological domains. These larger domains of application seem to pose particular challenges for any theory that eschews the Prosodic Hierarchy; thus, the discussion in §4.3 and §4.4 below serves as both a demonstration of how current analyses violate or adhere to Minimalist premises, as well as a blueprint for how these challenges might be met. It also serves to highlight a growing trend in the tone literature toward considerations of Modularity.

4.3 Case study 3: Kuria high tone placement

In this subsection, we summarize Sande et al.'s (2020) Optimality Theoretic account of tone placement in Kuria, a North-East Bantu language. Tone spreading in Kuria routinely crosses the boundaries of syntactic phases, making it a particularly interesting test-case for any interface theory. We discuss how Sande et al.'s (2020) analysis of this fact demonstrates that an OT-based approach can be consistent with a Minimalist approach to phonology (i.e., there is nothing inherently disqualifying about OT from the standpoint of Strict Modularity). We also point out that, although Sande et al.'s analysis invokes the PH, it does not appear to do any real work for them. This part of their proposal therefore warrants an appeal to the Minimalist Critique, which we briefly provide below.

Kuria verbal conjugations are marked with a segmental prefix, as well as being marked by a High tone that docks according to morpheme-specific instructions. For example, the tense-aspect prefixes /o-/ and /ra-/ each come with a lexical High tone, but the former's H is linked to the immediately following mora (or V on the CV-tier, if translated into CVCV terms), while the latter's H is linked to the fourth mora following the prefix (other affixes have other lexically-specified tone attachment sites). Low tones are unmarked. Tone spreading then applies up to the penultimate mora (Sande et al. 2020:1212). Below, the initial site of tone linking is underlined.[44]

(29) Mora-counting H assignment in Kuria verb stems (Marlo et al. 2015:252-253)

μ1 n-to-o-[hóótóótér-a]
FOC-1PL-TA-[reassure-FV]
'We have reassured.'

μ4 to-ra-[hootoótér-a]
1PL-TA-[reassure-FV]
'We are about to reassure.'

Interestingly, the H introduced by /ra-/ may link to a mora outside of the verbal complex, i.e. on the object, when the verb is sufficiently short (Sande et al. 2020:1213):

(30) μ4 to-ra-[rom-a eɣétɔ́ɔ́kɛ]
1PL-TA-[bite-FV banana]
'We are about to bite a banana.'

μ4 to-ra-[ry-a eɣétɔ́ɔ́kɛ]
1PL-TA-[eat-FV banana]
'We are about to eat a banana.'

[44] Abbreviations used in this subsection (not already defined above): FOC = focus; FV = final vowel; TA = tense-aspect marker.

Sande et al. offer an analysis of the availability of the object as a target for High tone linking within a phase-based realizational framework which is consistent with the operation of Phonological Merger in Newell and Piggott (2014), discussed above. The authors detail how such an account eliminates the need for constraints that violate Strict Modularity, such as interface MATCH constraints. Recall that a standard MATCH constraint would be along the lines of the following (Elfner 2018:6):

(31) MATCH-PHRASE
For every syntactic phrase (XP) in the syntactic representation that exhaustively dominates a set of one or more terminal nodes α, there must be a prosodic domain in the phonological representation that exhaustively dominates all and only the phonological exponents of the terminal nodes in α.

As we noted in §3, constraints like the one in (31), which directly reference items of the syntactic alphabet, violate Strict Modularity particularly when ranked among purely phonological constraints. This is because any operation capable of evaluating such a ranking (i.e., EVAL) would necessarily require access both the syntactic and the phonological alphabets simultaneously, in violation of Domain Specificity.

Recognizing this challenge, Sande et al.'s solution is to relegate phonological structure-building to the NΦ. The phonological string sent to PF by the syntax will undergo phonological computation, which includes, as a default, building a phonological domain around the entire string. The following constraint is proposed to capture this analysis:

(32) MAXIMIZE PROSODIC DOMAINS (Sande et al. 2020:1222)
All phonological content should be parsed into a single prosodic domain (e.g. word, prosodic phrase, intonational phrase).

Note that this constraint applies to a string that has been sent to PF via the mechanism of Spell-Out; it does not require any reference to XPs or X^0s (or to lexical or functional diacritics, also to be discussed below). In fact, it could be argued that it does not actually require the construction of prosodic domains like the PWd or PPh at all. Within a feed-forward cyclic architecture of the sort Sande et al. assume, the above constraint essentially says "at each cycle, compute phonology over the entire phonological string received". This strikes us as entirely Minimalist and consistent with the linear approach to phonology presented in the discussion of Ojibwe in §4.2.

For example, consider the data we saw above in (30). There, each nominal objects is contained within a DP, which we take to be a phase following much work in the literature.

(33) $[_{DP}$ eɣetɔɔkɛ] → /eɣetɔɔkɛ/

Nothing forces us to adopt Sande et al.'s proposal that prosodic structure must be built here (a PWd), nor that a left-edge CV be inserted.[45] Let us assume no extra structure-building occurs unless we have clear evidence for it.

Turning to the next phase, the *v*P contains the verb and its complement DP. At spell-out of *v*P, phonology will again consider the entire string. As there is no tone to spread from the verb stem, nothing relevant happens at this step. (Sande et al. propose that a PWd is built around the verb stem; but, since the construction of prosodic structure once again does not appear to be required here, we omit it.)

[45] Note that the marking (or not) of left edges with empty syllabic space as seen in section §4.2 is thought to be parameterized cross-linguistically (see Scheer 2004 and D'Alessandro and Scheer 2015), whereas the PH is thought to be universal, in the sense that all phonological material in all languages is assumed to be dominated by a non-zero number of prosodic constituents.

(34) $[_{vP}$ rom-a $[_{DP}$ eɣetɔɔkɛ]] → /romaeɣetɔɔkɛ/

Finally, the CP phase will be interpreted. Since the output of the *v*P and DP cycles both fall within the Spell-Out domain (the phase complement) of C^0, the entire string will be visible, following the discussion above regarding the absence of a phonological PIC (see §2.4).

(35) $[_{CP}$ to-ra $[_{vP}$ rom-a $[_{DP}$ eɣetɔɔkɛ]]] → /toraromaeɣetɔɔkɛ/ → [toraromaeɣétɔ́ɔ́kɛ]

In (35), the phonology sees the linear string that is contained within the Spell-Out domain of C^0, and phonological specifications (here determining tone placement) have access to everything within this domain. Tone spreads within domains determined by phases in Kuria, in the same way that sub-minimal prefixes cliticize in Ojibwe.

This subsection serves to demonstrate that Optimality Theoretic analyses, though often non-modular due to the presence of MATCH-type constraints ranked in the NΦ, are not inherently incompatible with a Strictly Modular, Minimalist account. Regardless of whether the Prosodic Hierarchy is required, is diacritic (and therefore not a possible phonological object, as argued in Scheer 2008), or is simply unnecessary, the account in Sande et al. (2020) avoids constraints that reference syntactic and phonological information simultaneously, while accounting for how tone spreading crosses phonological phrase boundaries—an important goal from the perspective of Modularity-minded theorists. The point here is simply that Minimalism requires us to take seriously the idea that it may not be necessary for both the NS and the NΦ to independently determine the size of phonological domains.

Next, we discuss another tonal phenomenon and a recent proposal put forward to capture it—one that does include MATCH constraints while nevertheless aiming to be Modularity-compatible.

4.4 Case study 4: Xitsonga tone spreading and penultimate lengthening

In this subsection, we discuss Lee and Selkirk's (2022) analysis of tone spreading in Xitsonga, a Southern Bantu language. The authors are concerned in part with the question of Modularity, and offer some seemingly problematic data for theories that seek to account for phonological domain effects without the PH (as we have advocated here). In §4.4.1, we detail Lee and Selkirk's analysis within the frameworks of OT and Prosodic Phonology, and show how their model falls short of the standard for Strict Modularity; then, in §4.4.2, we discuss some problems for their analysis and some Modularity-friendly alternative accounts of the same data.

4.4.1 A Prosodic Hierarchy account of Xitsonga: the MSO-PI-PO model

Following the initial proposal in Kratzer and Selkirk (2020:§6.1), Lee and Selkirk split the PF branch into two separate stages. First, there is spell-out from the *Morphosyntactic Output* (MSO) to the *Phonological Input* (PI), claimed to be roughly equivalent to Vocabulary Insertion; then, there is a mapping from the PI to the *Phonological Output* (PO), which the authors call the 'phonology *per se*' (akin to our NΦ).

(36) *The MSO-PI-PO interface model (Lee and Selkirk 2022:338)*

MSO (morphosyntactic output representation)

Spell-out ↓

PI (phonological input representation)

Phonology ↓

PO (phonological output representation)

Aside from Vocabulary Insertion, the MSO-PI stage of the derivation is when prosodic structure is generated, mediated by MATCH constraints. Combined with the constraints needed for the PI-PO stage, this gives us a system whereby OT constraints are computed in two cycles.[46] As mentioned in the introduction to this chapter, most (if not all) modular frameworks must have a means of translating the output of one module into an alphabet that is legible to another module (e.g. to transition from syntactic to phonological computation within frameworks adopting the Y-model). This is consistent with Strict Modularity *iff* the translation is a pure list-based (VI) mapping with no computation involved (as discussed in §2.1). As a module can only work with a single alphabet (either phonology or morphosyntax), a single MATCH constraint referencing items of both alphabets simultaneously, such as the following (cf. (31) above), cannot be involved in any computation within a Strictly Modular derivation:

(37) MATCHPHRASE (Kratzer and Selkirk 2020:19, Lee and Selkirk 2022:341)
For every instance of a Phrase in MSO there is exactly one instance of a phonological phrase φ that spells it out phonologically in PI.

If MATCH constraints are pure mapping instructions, and the relationship between the MSO and PI is uniformly isomorphic (non-isomorphism being derived subsequently in the computation of the phonology *per se*, as in Kratzer and Selkirk 2007), then it would be unnecessary to formulate these in the same fashion as standard OT constraints: simply put, full isomorphism can be captured straightforwardly without violable constraints. A group of inviolable MATCH Constraints would not need to be ranked or undergo EVAL, since such a computation would be superfluous (in addition to being anti-Modular). Of course, inviolable constraints go against the basic tenets of OT, but the separation of MATCH constraints from the NΦ could be seen as tantamount to removing MATCH constraints from the phonological computation entirely, as proposed by Sande et al. (2020).

Yet, this is not the proposal in Kratzer and Selkirk (2020) or Lee and Selkirk (2022). Their proposal involves a computation of ranked constraints between MSO and PI, where, for example, MATCH-PHRASE can be ranked alongside a constraint that destresses given material (cf. DESTRESSGIVEN: Féry and Samek-Lodovici 2006), where *givenness* is a decidedly non-phonological notion:

(38) [G] = No-φ (DEPHRASEGIVEN) (Kratzer and Selkirk 2020:29)
A [G]-marked constituent in MSO corresponds to a prosodic constituent in PI which is not a φ and contains no φ.

Clearly, a mapping algorithm that involves computing ranked constraints referencing both syntax (where G-marking presumably holds) and phonology violates Strict Modularity, and therefore does not qualify as a Minimalist account of the interface according to our premises. We will return to this issue in §4.4.2; but, before we do, we discuss why Lee and Selkirk (2022) view the Xitsonga pattern as problematic for any analysis based solely on cyclic Spell-Out. In brief, they argue that Xitsonga tone spreading and penultimate lengthening crucially involve phonological domain formation via the PH. If this is correct, then our endeavor to seek Minimalist alternatives to the PH is in jeopardy. Let us consider the relevant data.

In Xitsonga, lexical tone spreads from left to right, up to the penultimate vowel within its domain (as was the case above for Kuria). For example, comparing the PI (Phonological Input) to the PO (Phonological Output) in (39), we see that the applicative object *hosi* 'chief' bears an underlying H (indicated via underlining) which spreads to the penultimate syllable of the direct object *hlambeto* 'cooking pot' (indicated via ácúté áccénts). Interestingly, though, Lee and Selkirk demonstrate that

[46] This is much like the multiple strata proposed in Stratal OT, but where mapping itself is considered a Stratum. See Kiparsky (2015) and Bermúdez-Otero (2017) for overviews of Stratal OT. Note that the MSO-PI cycle is an addition to the interface analysis first proposed in Kratzer and Selkirk (2007).

this regular spreading process is disrupted when a potential target is 'modified' in the syntax (which includes both traditional adjuncts, e.g. adnominal adjectives, as well as numerals, etc.). Consider (40), whose PI differs from that of (39) only in that its direct object DP contains additional material besides the noun itself, here *yin'we* 'one' (adapted from Lee and Selkirk 2022: (19)):[47]

(39) *verb* [$_{NP1}$ *noun*] [$_{NP2}$ *noun*]
PI: ni hlawulela hosí hlambeto
1SG select chief cooking.pot
PO: ni hlawulela hosí hlámbé:to
'I select for the chief a cooking pot.'

(40) *verb* [$_{NP1}$ *noun*] [$_{NP2}$ *noun* [$_{MP}$ *mod*]]
PI: ni hlawulela hosí hlambeto yin'we
1SG select chief cooking.pot one
PO: ni hlawulela hosí hlambeto yi:n'we
'I select for the chief one cooking pot.'

Lee and Selkirk argue that this spreading pattern cannot be captured with a derivational/Spell-Out approach of the sort we are advocating here, as modification of the direct object should not, under standard assumptions, change its syntactic relationship to the source of the high tone in any relevant way (i.e., by introducing a new phase boundary).

Before addressing this challenge, let us first consider the position of the long vowels in the above examples. We can see that there is only one in each sentence: in the penultimate syllable of the entire string. Lee and Selkirk propose that this lengthening reliably diagnoses the right edge of Intonational Phrases (IntP), which are mapped from CPs. They argue that this diagnostic therefore demonstrates that even when the direct object is modified, it still belongs to the same Intonational Phrase (and thus CP) as the verb and the applicative object. In contrast, right-dislocated arguments show independent penultimate lengthening, while remaining subject to the same tone spreading restrictions as in (39)-(40).

For example, tone spreads onto *dokodela* 'doctor' in (41a), even though it constitutes a separate domain for final lengthening than the one in which we find *ho:sí*, the source of the high tone. By contrast, tone does not spread in (41b), where the right-dislocated nominal is modified by *ntshwá* 'new', even though the domains for penultimate lengthening are identical in the two examples (adapted from Lee and Selkirk 2022: (20)):

(41) a. ú-vóná ho:$^{\downarrow}$sí, dókódé:la
3SG-see chief doctor
's/he sees the chief, the doctor.'
b. ú-vóná ho:sí, dokodela $^{\downarrow}$ló:-ntshwá
3SG-see chief doctor CL1-new
's/he sees the chief, the new doctor.'

If penultimate lengthening is a reliable diagnostic for an IntP mapped from a CP in the syntax, then apparently High tone spreading in Xitsonga can cross boundaries mapped from entire clauses. The question then becomes how to account for this effect of syntactic modification on tone spreading while simultaneously accounting for penultimate lengthening.

Lee and Selkirk propose that the relevant effect here is not due to modification as such, but rather the binary prosodic structures that arise as the result of such modification. BINARITY is a

[47] Abbreviations used in this subsection (not already defined above): CL1 = noun class 1; CL6 = noun class 6; CL10 = noun class 10.

property commonly invoked in Prosodic Phonology: it refers to the apparent preference exhibited by phonological phrases (PPhs) to consist of exactly two prosodic words. In this case, the claim is that an unmodified noun maps onto a unary PWd, which would be an unsuitable PPh under Binarity. On the other hand, a modifier-noun pair will map to a PWd-PWd pair, and this resulting binarity qualifies it for containment within a PPh.[48] With this in place, Lee and Selkirk simply claim that tone spreading in Xitsonga cannot cross the left edge of a PPh—this yields the effect that tone spreading is blocked on modified nouns, as seen above. The prosodic output structures they propose for (41) are below (based on Lee and Selkirk 2022: (21)-(22)):

(42) a. (IntP (IntP (PPh (PWd ú-vóná) (PWd ho:↓sí))), (PWd dókódé:la))
's/he sees the chief, the doctor.'

b. (IntP (IntP (PPh (PWd ú-vóná) (PWd ho:sí))), (PPh (PWd dokodela) (PWd ↓ló:-ntshwá)))
's/he sees the chief, the new doctor.'

While the account providing the structures in (42) correctly describes the domains for tone spreading and penultimate lengthening, it is not explanatory. More specifically, it is unclear why tone spreading is permitted to cross the right boundary of an IntP and the left boundary of a PWd, but is barred from crossing the left edge of a PPh, which is structurally intermediate between the two on the Prosodic Hierarchy. Simply put, such a pattern is not motivated phonologically. For the reasons outlined in §3.2, this is not surprising: the components of the PH make no independently-motivated phonological predictions.

If we restrict the discussion to left boundaries, then tone spreading will be blocked by any boundary higher on the PH than the PWd; however, there is nothing in PH theories that makes the left edges of domains inherently stronger than right edges. Thus, to implement this edge-strength asymmetry, Lee and Selkirk appeal to CRISPEDGELEFT(φ,H), a constraint that bans the left edge of a PPh from appearing within a High-tone span. Again, this is descriptively adequate to capture the data discussed in (42), but it is not explanatory: it does not address the question of why CRISPEDGELEFT should hold of Phonological Phrases in particular, to the exclusion of prosodic constituents that are either lower or higher than it on the PH (e.g. IntP, PWd).

Moreover, other facts from Xitsonga involving focus movement within the DP (Lee and Riedel 2023) and negative sentences (Kisseberth 1994) would seem to pose serious empirical challenges for Lee and Selkirk's (2022) analysis. We briefly discuss two such challenges here.

First, Lee and Riedel (2023) demonstrate that DP-internal modifiers in Xitsonga may undergo focus movement to the left periphery of the DP. When they do, they constitute their own domain for penultimate lengthening. This is unexpected given Lee and Selkirk's (2022:357) claim that domains of penultimate lengthening in Xitsonga reliably diagnose Intonation Phrases mapped from clause-sized structures. For example, in (43a), no focus movement is involved (and canonical N-NUM-ADJ word order arises), whereas in (43b), the adjective has been fronted to the DP-internal FocP, and then surfaces with penultimate lengthening (adapted from Lee and Riedel 2023: 5; 13):

(43) a. Ma-sangu ma-mbirhí ma-ntsó:ngó
CL6-sleeping.mat CL6-two CL6-small
PO: (IntP (PPh (PPh masangu mambirhí) ma-ntsó:ngó))
'Two small sleeping mats' ((N Num) Adj))

b. Ma-mbi:rhí má-sángu ma-ntsó:ngó
CL6-two CL6-sleeping.mat CL6-small

[48] Lee and Selkirk (2022) do not discuss any examples of multiple or 'heavy' modifiers that might constitute more than one PWd, nor unmodified complex nominals (e.g. noun-complement structures, compounds, etc.). Such examples are necessary if we wish to understand whether BINARITY is really at work here, which in turn will directly inform the right theory of how tone-spreading is blocked in Xitsonga.

PO: ($_{\text{IntP}}$ ($_{\text{PPh}}$ ($_{\text{PPh}}$ mambi:hrí) ($_{\text{PPh}}$ má-sángu ma-ntsó:ngó)))
'TWO small sleeping mats' (((Num) (N Adj)))

As opposed to the right-dislocation structures in examples like (41), there are no syntactic reasons to think that focused modifiers such as *ma-mbi:hrí* 'TWO' in (43b) should have clausal status, which is what they would need to have if Lee and Selkirk's penultimate lengthening diagnostic uniquely identified IntPs mapped from CPs.[49]

In fact, examples such as (43b) pose a critical problem for the analysis of High tone spreading in Lee and Selkirk (2022), as CRISPEDGELEFT unexpectedly fails to hold for such cases. Tone spreads out of ($_{\text{PPh}}$ *mambi:hrí*) 'TWO' and, crucially, onward into ($_{\text{PPh}}$ *má-sángu ma-ntsó:ngó*) 'small sleeping mats', thereby violating CRISPEDGELEFT. Assuming there is no constraint SOFTEDGELEFT that could dominate CRISPEDGELEFT in the presence of focused XPs, the output in (43b) ought to be Harmonically Bounded by a candidate which does not involve tone spreading across the left edge of this PPh. Thus, an alternative to Lee and Selkirk's (2022) PH-based account of penultimate lengthening and tone spreading in Xitsonga is warranted.

As a second empirical challenge for the PH-based account, consider that negation in Xitsonga introduces a High tone that spreads throughout the verb and its objects. Crucially, this spreading occurs even if those object DPs contain modifiers (Kisseberth 1994:193):[50]

(44) a-ndzí-vóní tí-ngúlúvé tá mí:ná
NEG-1SG-see CL10-pig CL10.POSS my
'I do not see my pigs.'

By analogy with the sentences discussed in Lee and Selkirk, the phrase *tí-ngúlúvé tá mí:ná* 'my pigs' should project a PPh and block High-tone spreading in (44), contrary to fact. The question of how this type of pattern accords with the PH account of affirmative sentences is quite important. There is no way to distinguish the prosodic structure of negative and affirmative sentences without appealing to the morphosyntax in Xitsonga: negative morphemes do not have any overt phonological properties that would allow their High tone to spread more freely than others.[51] We have now seen multiple syntactic factors in Xitsonga – negation, modification, dislocation, etc. – that impact the domains of tone spreading. In the end, it seems that more detailed work on the relationship between Xitsonga syntax and its phonology is needed.

4.4.2 Alternative analyses of the Xitsonga pattern

This subsection contains discussion of alternatives to the PH-based approach to the Xitsonga facts detailed above. We aim to show here that there are multiple derivational or representational accounts that could describe the problem of Xitsonga's non-isomorphic domains for the application of High tone spreading and penultimate lengthening. A theory that can capture the same facts but with superior explanatory power (including the cognitive plausibility that comes with any Strictly Modular theory) is to be preferred on grounds of both Minimalist reasoning and Occam's razor.

Patterns on par with the Xitsonga data have received alternative analyses in both Pak (2008) and Sato (2009). These authors propose that the timing of linearization or Spell-Out (respectively) is

[49] Lee and Riedel (2023) are aware of this problem with the distribution of penultimate lengthening, and discuss a potential solution whereby the PWds mapped from focused XPs are then promoted to IntPs in the phonology (thus eroding the reliability of IntP as a diagnostics for CP). However, they opt instead to simply allow focused XPs to also trigger penultimate lengthening (thus weakening the reliability of penultimate lengthening as a diagnostic for IntP).

[50] The original example from Kisseberth (1994:193) is unglossed. We have attempted to cobble together a gloss here based on various published sources on Xitsonga, but we have been unable to confirm its accuracy.

[51] The High tone introduced by negation in Xitsonga has additional properties that distinguish it from High tone spreading in affirmative sentences, but we do not believe these bear on the facts under discussion, so we leave them aside.

affected by whether a node is modified or not. Either of their accounts could capture the effect of modification in delimiting tone spreading in Xitsonga. Briefly, they propose that a single/simplex phrase does not constitute its own Spell-Out domain, but rather is spelled out with – or directly linearized in relation to – the phrase it Merges with. By contrast, a complex multi-word phrase constitutes its own Spell-Out domain, which is therefore spelled out separately from – and/or linearized internally before being linearized in relation to – the phrase it Merges with. This type of approach allows for tone spreading to be phase-bounded, while still permitting simplex modifiers (but not complex ones) to count as part of the spreading domain. These types of accounts rely on the sequential nature of the cyclic derivation: tone spreading occurs at Spell-Out or direct linearization (within a phonological cycle), but since separate cycles are only linearized in relation to each other at a later stage of the derivation, tone spreading is not possible across separate Spell-Out domains (reminiscent of the distinction between /bi-/ vs. /ni-/ in the discussion of Ojibwe: §4.2). The challenge for these approaches lies in accounting for the right-dislocated phrases in (41): namely, the fact that they vary as to whether they are separate Spell-Out domains for the purposes of tone spreading, but are always separate Spell-Out domains for the purposes of penultimate lengthening.

Scheer (2011:§4) and Newell and Scheer (2017) call cyclic accounts of domain formation *procedural*, because the derivation itself is proposed to interact with the timing of the application of phonological rules/constraints in a way that explains a pattern. It is clear that the right-dislocated phrases in (41) are separate phases from the rest of the clause (following analyses like those in Tanaka 2011), and that the verb and its remaining objects are nested within a single CP domain. We can therefore account for penultimate lengthening easily with a rule that lengthens the penultimate vowel within a Spell-Out domain. This also captures the separate spell-out of modifiers that undergo focus movement, as in (43).

However, what Lee and Selkirk (2022) argue is that such a strictly procedural account will not be able to capture both the penultimate lengthening facts and the tone-spreading facts simultaneously, and therefore the representational, non-isomorphic PH is additionally required. Even assuming for the moment that Lee and Selkirk's analysis can be modified to capture the data in (44), it is important to note that they do not compare their PH account to other representational accounts on the market (a representational account of domain formation being any that inserts phonological structure that blocks or triggers the application of phonological rules/constraints). The PH is a representational account of domain formation, but so is the CV-insertion theory discussed in §4.2. In fact, in terms of their ability to capture most of the Xitsonga facts above, the two types of accounts actually tie (assuming both are implemented with the mechanisms of cyclic Spell-Out). Let us therefore consider an alternative representational account of these facts from CVCV Phonology.

In a CVCV analysis, Spell-Out domains would define the application of penultimate lengthening as outlined just above. In addition, the translation procedure would insert an empty CV at the left edge of any string corresponding to a modified nominal; that CV would then block High-tone spreading (somehow; see below). We illustrate this informally in (45), where square brackets indicate relevant syntactic categories (not phonological structure), and a CV is inserted only at the left edge of strings translated from CPs and modified DPs.[52] (We omit the autosegmental representations here for clarity; see §4.2.3.)

(45) a. [$_{CP}$ ú-vóná [$_{\nu P}$ [$_{DP}$ ho:$^{\downarrow}$sí]]], [$_{DP}$ dókódé:la]
CV ú-vóná ho:$^{\downarrow}$sí dókódé:la
's/he sees the chief, the doctor.'

[52] Though it makes no difference for these particular examples, we assume that no CV is inserted at the νP phase here since, following V-movement, it contains no overt material beyond what would have already undergone phonological computation as part of the object DP (see Zeller 2013).

b. [$_{CP}$ ú-vóná [$_{vP}$ [$_{DP}$ ho:sí]]], [$_{DP}$ dokodela ↓ló:-ntshwá]
CV ú-vóná ho:sí **CV** dokodela ↓ló:-ntshwá
's/he sees the chief, the new doctor.'

The challenge for such an approach, of course, is to ensure that only the phonological strings translated from (CPs and) modified DPs have an empty CV inserted at their left edge (for selective CV-insertion based on other factors, see Scheer 2012:§310 and D'Alessandro and Scheer 2015). We can imagine various possible implementations, each of which is necessarily based in the syntax, as this is all translation can work with. We can only briefly sketch one such potential implementation here; its plausibility needs to be investigated more thoroughly, taking into consideration some finer details of Xitsonga syntax not currently available to us (see fn. 48 for just one such area where more syntactic data is required, concerning questions of BINARITY).

One possibility is that bare ('unmodified') nouns in Xitsonga are too small to constitute a cyclic Spell-Out domain: such NPs lack the relevant functional structure (say, D^0) to project a phase. This would mean they would never arise at the left edge of their own cycle (they do not spell out in their own phase), and thus their corresponding phonological representations would not be candidates for left-edge CV insertion. If the presence of 'modifiers' entails the presence of additional functional structure (following Cinque 2005 and much subsequent work), in turn entailing the projection of a phase, then it would follow that an empty CV would be inserted at the left edge of only such 'modified' nominals, correctly blocking High tone spreading. We will assume such an analysis is possible in principle, pending further investigation into the syntax of Xitsonga. (This general approach has obvious parallels with what has been proposed for languages with pseudo noun incorporation, as in Massam 2001, among others; this should inform future work on the question.)

So far, the two theories under comparison here (one PH-based, one CVCV-based) are roughly equivalent in their ability to fit the Xitsonga data. However, there is one area where the PH-based approach makes the wrong predictions (as mentioned above), whereas the CVCV-based approach captures the facts straightforwardly. The facts in question are those from (43) involving DP-internal focus fronting. Recall from the discussion above that Lee and Selkirk's (2022) CRISPEDGELEFT predicts no H-tone spreading out of focused XPs, contrary to fact; this is because the phonological material immediately following the focused XP is wrapped in a PPh whose left edge should be a barrier for tone spreading. By contrast, no such post-focal boundary is present the CVCV approach, since empty CVs are only inserted at the left edges of Spell-Out domains (and the only relevant phase is the maximal projection of the nominal, DP, which dominates the FocP). The distribution of domain delimiters within the CVCV approach is illustrated below. (We assume that derived specifiers such as the [Spec,FocP] below constitute their own Spell-Out domains, and will thus surface with their own empty left-edge CV in the phonology; however, nothing crucial relies on this here.)

(46) a. [$_{DP}$ Ma-sangu ma-mbihri ma-ntsó:ngo]
CV Ma-sangu ma-mbihri ma-ntsó:ngó
'Two small sleeping mats'
b. [$_{DP}$ [$_{FocP}$ [$_{XP}$ Ma-mbihri] ma-sangu ma-ntsó:ngó]]
CV CV Ma-mbi:hri má-sángu ma-ntsó:ngó
'TWO small sleeping mats'

Since the material following [Spec, FocP] does not constitute a Spell-Out domain, it is not a target for empty CV-insertion at translation; thus, High-tone spreading from the focused XP into the material to its right is correctly predicted to be possible without any additional stipulation. This represents a clear advantage of the CVCV-based theory over the PH-based theory, at least for this set of facts.

Taking stock, empty CVs therefore seem to perform better than PH-based prosodic domains

in correctly predicting patterns of High-tone spreading in Xitsonga. Many important challenges remain to be addressed for the CVCV-based theory we have discussed here, however. For example, although CV-space is well-suited for e.g. blocking assimilation or triggering epenthesis, it is not immediately clear how it would block tone spreading in (45). Although we can imagine possible accounts of this, we wish to emphasize that, with respect to this particular challenge, the two theories once again tie: neither domain-delimiting device (CV-unit vs. PPh) has an intrinsic ability to block High-tone spreading, so something extra must be said in both accounts (see Newell 2023 for preliminary thoughts on this).[53] Ultimately, more work needs to be done on the different predictions made by each competing theory, accompanied by a more detailed syntactic analysis of the phenomena under discussion.

In sum, while the proposal in Lee and Selkirk (2022) does not qualify as strictly Minimalist according to our premises, we wish to highlight once again (see §4.3) what we see as a positive trend developing in the OT-Prosody literature: namely, that Strict Modularity seems once again to be a going concern for mainstream theories of Prosodic Phonology, after seemingly having fallen off the research agenda for some time.[54] We can conclude by agreeing with Lee and Selkirk (2022) that Xitsonga offers a challenging puzzle for any single framework, but remain optimistic that a Minimalist account that adheres to Strict Modularity can be found.

5 Conclusion

Much of the burden faced by any theory of the syntax-phonology interface lies in one essential task: defining the domains of application for various phonological processes based on structures generated in the syntax. This domain-delimiting task has occupied interface theorists since the very beginning of the generative enterprise right through to the present day. Nevertheless, there have been vanishingly few attempts to subject the resulting interface theories to the kind of methodological and architectural considerations that have characterized the Minimalist Program since the mid-90s.

We have attempted to lay out the benchmarks that any theory of the syntax-phonology interface must meet in order to qualify as Minimalist, under our current understanding of that term. The most restrictive of these standards are Strict Modularity and the elimination of architectural redundancy imposed by the Minimalist Critique. We take both of these to be non-negotiable for any Minimalist interface theory.

Theories relying on diacritic features and/or items of the Prosodic Hierarchy were found not to meet those benchmarks: the use of the either of these poses many problems for a Strictly Modular theory of the interfaces. While some of these can be overcome by adopting non-traditional implementations of, for example, the Prosodic Hierarchy (see §4.3), others remain. We therefore explored some Minimalist alternatives to the standard interface analyses given in the literature for a number of challenging case studies. We furnished an alternative to the "deletion at PF" view of ellipsis—one which makes no reference to PF whatsoever, but instead takes elliptical silence to be the result of null exponence. We also reanalyzed a number of more obviously-phonological phenomena whose domains of application seem to be influenced by syntax. With regard to the latter, we demonstrated the viability of a strictly-linear solution to the problem of domain delimitation rooted in the CVCV

[53] If one assumes that tone links inside the segmental structure rather than to the CV-tier, then the empty V of left-edge CV-units would not be a proper target for tone spreading, similar to blocking effects in analyses of Vowel Harmony, for example. We will not explore this analysis further here, but see Kula (2012) for arguments supporting the segment-internal attachment site of tone.

[54] However, as exceptions to this claim, see work by e.g. Ricardo Bermúdez-Otero, Tobias Scheer, Jochen Trommer, and Eva Zimmerman. For the historical role played by Modularity in the development of Prosodic Phonology, see Scheer (2011:§406).

Phonology framework, namely the appearance of empty CV-units (i.e., empty syllabic space) at relevant junctures. We showed that the allomorphic nature of elided material makes correct predictions about the patterning of tone sandhi in Taiwanese, and that empty CVs make phonological predictions that the Prosodic Hierarchy does not. We hope that future work takes up the task of confirming and expanding these predictions, and extending this general approach to the (re)analysis of other interface phenomena.

Our insistence on subjecting theories of the syntax-phonology interface to the Minimalist Critique and a Strictly-Modular standard creates many new challenges—many more than we were able to address in this chapter. Among the relevant phenomena that we were not able to discuss – but which will nevertheless contribute an essential part of any truly Minimalist theory of the syntax-phonology interface – are intonation, phrasal stress assignment, and linearization, among others. These must be left to future work, but we hope to have provided a blueprint for analyzing them in a Minimalist way. Finally, we hope this chapter helps to promote the growing trend of cross-modular work on the interface: the challenges we raise here cannot be met without more collaboration between phonologists and syntacticians. Inter-modular communication is essential in interface derivations and interface collaborations alike.

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