Phases and Phonology

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0. Introduction

Both the syntactic and phonological derivational systems give incontrovertible evidence of being composed of multiple domains. This is proposed in both modules as being due to distinct cycles of computation in the production of complex output forms. In the syntactic module this is currently thought to be due to phases. Phases were proposed in Chomsky (2000, 2001) and have been elaborated on in much subsequent work by many syntacticians.[1] Examples of this evidence in morpho-syntactic computation comes from operations such as movement, agreement, and allomorphy. As phases are syntactic cycles that effect transfer to the phonological module, phonological cycles are seen in much current work as also stemming from phases, although there is less consensus on the topic of this proposition in the literature. Examples for cyclicity from phonological computations include assimilation, syllabic organization, and prosodic phrasing. Early dissertations that proposed these cyclic effects to be due to phases include Marvin (2002), Newell (2008), Pak (2009), and Samuels (2009). Much recent work has continued this tradition (e.g., Scheer 2004, Kratzer & Selkirk 2007, Samuels 2012, Scheer 2012, Newell & Piggott 2014, Sande et al. 2020). Work that questions the role of phases in phonology includes Embick (2014), Grewendorf, G. and Kremers (2014), Cheng & Downing (2016), Bermúdez-Otero (2018), and Kratzer & Selkirk (2020). A perpetual question in the study of the interface between the morphosyntax and the phonology has been whether these domains are isomorphic, along with the concomitant question of what (non)isomorphism tells us about the relationship between the two grammatical modules (see Newell & Sailor in press for a current discussion of the interactions of these modules within the Minimalist framework). This chapter examines in detail how phases are proposed to account for the derivation of both syntactic and phonological domains. The first half of this chapter will offer a detailed comparison of the different (and sometimes opposing) proposals made regarding the syntactic properties of phases (§1). This lengthy discussion of syntactic proposals in a chapter on phases and phonology is crucial. Phonological analyses that employ phases

[1] See Citko (2016) for a recent overview of the syntactic tests for phases. The history of cyclicity in the syntax long predates the term 'phase' and goes beyond the scope of this chapter. See Boeckx and Grohmann (2007) for a clear discussion of the history of cyclic domains in the syntactic literature.

always begin with assumptions about the identity and functioning of phases in the syntax. Unless the phonologist can motivate the phases assumed in their work, the phonological patterns analysed cannot be used to fruitfully discuss a phase-based interface computation. There is an important amount of variation and disagreement within the syntactic literature when it comes to the properties of phases. It is therefore crucial for any phonologist working at the interface to be able to speak to the particular version of phase theory they have chosen in their analysis. In order to do this, it is necessary to be able to speak to the nuanced variations that are available. Section 1 therefore outlines varying syntactic opinions regarding the identity (size) of phases, the domain of spell-out triggered by the phase, and the interactions between previously-interpreted phases and the rest of the derivation (including the Phase Impenetrability Condition). Only after the relevant variables available withing phase theory have been has been enumerated do we turn to a discussion of how they might be fruitfully examined through the lens of phonological computation. Sections 2 and 3 therefore introduce some relevant theoretical phonological considerations. This includes, in §2, a discussion of non-phasal tools that also play a role in explaining cyclic phonological computation, notably the Prosodic Hierarchy's interface levels (the Prosodic Word and above), autosegmental levels that are native to the phonology-proper (the foot and below) as well as some computational considerations such as phonological levels and constraint rankings. Then, in §3, we discuss how these phonological tools combine with phase-based architectures to derive a single data set: Italian s-voicing. The goal of this section does not depend on the particular account of this voicing in the phonology itself. The goal is rather to examine how the different phase-based systems compare in the analysis of a single pattern. We will then conclude in §4, noting that phases are a strong explanatory tool for phonological domain-formation. However, the phonological module itself is argued to be better able to account for phenomena such as opacity and transparency across domains, following the discussion in §3 of how detailed assumptions about phonological computation and structure-building may impact communication across domains. The take-home message of this chapter is that any analysis at the syntax-phonology interface within a phase-based system must be very explicit about its computational and representational assumptions in order for its conclusions to be convincing and testable.

1. Phase Variations

This section gives an overview of the different considerations that come into play in the syntactic literature on phases. As is noted in any discussion of phases, there is no current consensus regarding their specific labels or their additional properties (detailed below). This is a serious stumbling block for the analysis of how phases interact with phonological computation, as small variations in the proposed timing and size of the domains of syntactic computation impact whether one can conclude that syntactic and phonological domains of computation are isomorphic. In this section I endeavor to be

more specific about how proposals vary in the syntactic literature. The goal of this is to enable phonologists working at the interface to better understand the points of variation and their motivations so that they may incorporate these considerations into their analyses of interactions at the phonology-morphosyntax interface. Sections 1.1-1.4 enumerate the various implementations of phase theory in the syntactic and PF-interface literature. This overview will allow us, in §2, to demonstrate a comparative analysis of a single data set that will lay out the predictions of the different variants of phase theory and how cyclic spell-out influences phonological computation.

Before getting into the details of how phases may vary, I would like to remind the reader that all variations of phase theory in the literature share, at least, the following basic tenets:

(1) a. Phases emerge due to properties of certain heads/configurations in the syntactic module.
    b. Phases impose locality conditions on syntactic processes, constraining long-distance dependencies such as agreement and movement.
    c. Phases trigger transfer to, and result in interpretation at, the PF (Phonological Form) and LF (Logical Form) interfaces.

There is, however, significant variation in the literature regarding the details of the above basic properties. The areas of variation in the definition and implementation of phases that we find in the literature can be classified as follows.[2]

[2] I do not imply here that this is a fully comprehensive list of variation in how phases are argued to work in the literature. These are, however, what I consider to be the major threads of variation.

(2) a. Which syntactic constituents are considered to be phases. (§1.1)
b. How the timing of the transfer of phases to the interfaces is determined, and what defines the 'phase edge'. (§1.2)
c. What the syntactic domain of spell-out is at any non-initial phase (X+n). Specifically, whether the domain of spell-out at *z*P (phase X+1) in the following configuration (A) includes all material in the complement of *z*P (Ai), or only the structure that has not yet undergone interpretation (Aii). The derivation of (A) assumes that *x*P (phase X) has spelled out its complement, WP (§1.3):

(A) [*z*P YP [*x*P WP]]
(Ai) [YP [*x*P WP]]
(Aii) [YP [*x*P]]

d. Whether, how, and when items that have previously undergone spell out are accessed later in the derivation. (both in the phonology and in the syntax); The Phase Impenetrability Condition (PIC); (§1.4)

Let us consider each of these points of variation in turn.

1.1 The syntactic constituents considered to be phases.

The variation in the definitions of (2a) are as varied as the possibilities. Chomsky (2000) proposed that CP and v*P (propositional, or strong vP) were syntactic phases. He allowed, however, in (2001) that all vPs might be phases, and then in later work (2004, 2005, 2007, 2008) that phases might be extended to include DPs and smaller *x*Ps (category-defining domains defined by derivational morphemes). Arguments for the extension of phasehood beyond CP and v*P can be found throughout the literature on phases. Legate (1998, 2003) demonstrated that passive and unaccusative vPs, like transitive v*Ps, have the predicted edge-properties of phases. DP and PP have been often proposed to be phases (McGinnis 2001; Svenonius 2004, Abels 2003, 2012; Boskovič 2012, 2013 among many others).[3] These proposals often relate the phasehood of these structures to how much functional structure they project in their peripheral domain. If particular syntactic phrases vary in their structure (e.g. if DPs can be smaller or larger), and their size determines whether they have the properties of phases, this might mean that it is not in fact the category of a phrase that gives it its phasal properties, but rather whether it meets a certain levels of functional complexity. This may seem conceptually at odds with proposals like those in Chomsky (2000, and subsequent work) that v*P and CP are phases, and those within the framework of Distributed Morphology (e.g., Marantz 2001, 2007) that category-defining heads are invariably phase heads (ex. the adjectivizing *-al* in

[3] See van Urk (2020) on the different properties of DP and PP phases specifically, and Čitko (2016) for a full volume on the different properties of distinct phrasal constituents that have been proposed to be phases.

parental or the nominalizing *-er* in *teacher*) but it is not necessarily so. If category-defining heads have the same relevant properties that higher functional heads do (triggering spell-out), the variation in the spell-out of larger, functional, phases can be reconciled by proposing that lower functional categories behave on par with root morphemes in not triggering transfer to the interfaces. Many researchers have proposed that phase domains are variable, and that this variability may depend on the different properties of phase heads cross-linguistically (Grohmann 2000; Svenonius 2004; Marušič 2005; Gallego 2005, 2007; Gallego and Uriagereka 2007; Den Dikken 2006, 2007; Müller 2010; Richards 2011; Harwood 2015; Bošković 2017) or on feedback from the instructions for Vocabulary Insertion (Bobaljik 2012, Bobaljik and Wurmbrand 2013, Marantz 2013). Works such as Epstein and Seeley (2002), Den Dikken (2006), Müller (2010), and work in Nanosyntax (Baunaz et. al. 2018) propose that there is at least partial interpretation of the syntax by PF and LF upon each instance of merge in the syntax. This is not the standard view in the literature on phases, where phase heads are considered to be a subset of syntactic heads, but we must keep in mind that a consensus on which heads are phase heads has not been reached.

The lesson that the researcher working at the phonology-syntax interface is to take from the above discussion is that it is important to not simply assume that a head X is a phase head (or a phrase XP is a phase) without looking at the theoretical, syntactic, phonological, and semantic evidence. That there is not yet a universally agreed-upon list of cross-linguistic phase heads does not mean that the notion of phases is untenable, but rather that it is more complex than originally proposed. The field is still working on this problem. Phonologists in particular must be aware that very fine syntactic distinctions may be involved in the definition of phases both within and across languages.[4] We must be wary of the potential confounding impacts of applying a simplified or incorrect syntactic analysis or definition of phasehood when analysing phonological patterns.

1.2 The timing of the transfer of phases to the interfaces, and what defines the phase edge.

In order to discuss (2b), we must look at the different proposals for how cyclic spell-out functions.[5]

Concomitant with the emergence of phases, Uriagereka (1999) noted that the merger

[4] Cross-linguistic variation may be due to either (i) variation in the identity of phase heads, or (ii) to cross-linguistic differences in syntactic structure. For example, a system that includes variation of type (i) would propose that certain features are responsible for the phase-status of a head. Since variation in the featural makeup of morphemes is common (see the Borer-Chomsky conjecture) it would be odd to not find variation if phasehood were to be determined to be featural. In a system where phasehood does not vary lexically, we might still expect to see cross-(and intra)linguistic variation of type (ii) if, for example, DP is a phase but certain nominal constructions in certain languages do not project DP.

[5] We will concern ourselves here only with the proposals that are particular to phases.

of distinct command chains in the syntax encountered problems with linearization; that the mechanism for linearizing subjects and adjuncts with the 'trunk' of the syntactic tree required that these complex left-branches be spelled out before merger. It was proposed that PF interpretation rendered complex branching structures opaque; they became *atomized* (see also Johnson (2003) for an application of this concept to moved constituents). To be *atomized* meant that the complex structure became essentially monomorphemic in the syntax. This allowed (i) for the linearization of complex subjects and adjuncts (and everything they contain) to the left of the structure they merge with, and (ii) for an explanation of why these constituents should be opaque to extraction. As a concrete example, consider (3).

(3) [[In the 90s PP] [a clever syntactician DP] amended the received position CP]

In Uriagereka's system both the adjunct *In the 90s* and the subject *a clever syntactician* in (3) would undergo interpretation (including PF linearization), as would the entire clause. At the point where the clause underwent interpretation, the adjunct and subject would be treated as single 'words' rendering their internal structure opaque, just as words were generally considered to be at the time.[6] It is of note that this version of cyclic spell-out, unlike phase theory, did not include the notion of 'edge'; the entire left-branch structures were computed.

Another theory of cyclic syntactic domains that emerged in the same era was Grohmann (2003a)'s notion of Prolific Domains. In this system, the domains of spell-out were defined by 'context values.' The three possible values were as follows:

(4) Grohmann's Prolific Domains
(i) $|\Theta|$ ranges over thematic relations;
(ii) $|\Phi|$ ranges over agreement properties;
(iii) $|\Omega|$ ranges over discourse information.

(Grohmann 2003a:294-295)

These domains can be roughly translated as the lexical (thematic) domain, the inflectional (between vP and CP) domain, and the discourse (expanded CP) domain. These domains are not restricted to the CP command-chain, but are also found in, for example, nominal domains, which are known to parallel clause structure (Abney 1987). Movement from within one of these domains was proposed to target the subsequent domain (e.g. items in Θ could move into Φ but not within Θ[7]), and each of these domains was sent to spell-out independently. This, in comparison to Uriagereka's system, allowed

[6] For a discussion of Lexical Integrity, the opaque behaviour of 'words' in the syntax, see the chapter Lexical Phonology and the Lexical Syndrome (wbctp0094), this volume.

[7] This is part of the larger discussion in the literature on syntactic anti-locality (Grohmann 2003b).

for sub-domains of a single command-chain to undergo independent spell-out. Consider (5), where (3)'s structure has been elaborated slightly.

(5) [[In [the [90s $_{nP}$] $_{DP}$] $_{PP}$] [a [clever syntactician $_{nP}$] $_{DP}$] [amended [the [received position $_{nP}$] $_{DP}$]] $_{vP}$] $_{CP}$]

In (5) both DPs (Ω) contain nPs (Θ) and therefore spell-out will occur at the level of nP before spell-out of DP. Additionally, the CP (Ω) contains a vP (Θ), and therefore spell out will occur at vP, and then subsequently at CP. The number and types of spell-out domains are therefore more numerous in Grohmann's system than in Uriagareka's. But, like in Chomsky's phase theory (below), items initially merged in a lower domain were permitted to move into a higher domain, allowing them to escape spell out until later in the derivation. This type of derivation therefore includes the notion of an 'edge'. An 'edge' is a position that is present in the syntax that, despite being present at the time of transfer to the interfaces, delays its own transfer until the next cycle of interpretation.

Chomsky's Phase Theory (Chomsky 2000 and subsequent work) is closer in kind to Grohmann's system than to Uriagereka's, while sharing properties of both. It defined two of the properties discussed above in ways that are specific to Phase Theory: (i) the proposal that cyclic domains be separated into two parts; the spell-out domain (the complement of the phase head), and the 'edge' (the phase head and any specifiers of this head), and (ii) the Phase Impenetrability Condition (PIC). Note that (i) is distinct from Grohmann's notion of prolific domains and how movement escaped a spell-out domain, as the head and complement of a Phase in Chomsky's system are generally considered to be parts of the same syntactic (prolific) domain. The PIC is similar, but not identical, to Uriagereka's atomization, as the former allows for the atomization of domains that are not complex left branches. These two proposals of Chomsky's were related, and the broad strokes of the argumentation for their roles in the derivation were as follows. First, the PIC entails that anything that is sent to spell-out is rendered invisible to further syntactic computation. As transfer/interpretation was not restricted to left branches, but could apply to the complement of v*P, this system required that something be 'left behind' for the heads in the subsequent phase to merge with: the phase edge. These two notions led to the definition of the spell-out domain of the Phase, via the definition of the PIC, as in (6).

(6) Phase Impenetrability Condition (1)

> In a phase with head H, the domain of H is not accessible to operations outside; only H and its edge are accessible to such operations.
>
> (Chomsky 2000:108)

(6) entailed that at the completion of the construction of a phase, say vP, any constituent within the phase that had uninterpretable features would move to adjoin to its edge (vP). Anything remaining inside the complement of vP would then be sent to the

interfaces, rendering it inaccessible to further syntactic computation by the PIC. This movement to the edge was (and still is) mitigated by edge-features; features whose sole purpose is to trigger movement to the edge. These edge features are necessary to avoid positing look-ahead in the syntactic derivation; movement to the phase edge is not driven by the PIC in the syntactic derivation, as the PIC is not a syntactic object. Subsequent argumentation that certain syntactic relations could hold between elements in, say, TP and elements in the complement of vP (e.g. Exceptional Case Marking) led to the conclusion that (6) was too strict and inspired a modification to the PIC that incorporated a delay in the spell-out mechanism (7).

(7) Phase Impenetrability Condition (2)
For [ZP Z . . . [HP α [H YP]]]: The domain of H is not accessible to operations at ZP, but only H and its edge.

(Chomsky 2001:13)

(7) entailed that spell-out targeted phasal domains, ex. the complement of vP, but that movement to the phase edge and spell-out of the phase complement were triggered not at the merger of v^0, but rather at the merger of the subsequent phase head (e.g. C^0). In this system there is therefore a period during the derivation where the complement of vP and the projections between v^0 and C^0 (inclusive) are visible to each other, as the PIC only comes into effect upon transfer.

One major shift between the Uriagereka/Grohmann and Chomsky systems was that in Phase Theory phases were defined by particular syntactic heads with specific properties that triggered phases. In the Multiple Spell-out/Prolific Domains systems phases were dynamic; their size and labels depended on their environment. In Multiple Spell-Out, a left-branch would be spelled out regardless of the identity of its dominant head, and in Prolific Domains, the highest head in the Θ-domain was defined by the merger of the first head in the Ω domain, not by its own features or label. This discussion highlights how the perception of spell-out domains has been debated from the outset of the emergence of phase-type theories.

We can summarize these original phase-type works and their proposals regarding the domains of interpretation as in Table 1.

	Spell-out of Constituents only (No nested phases within a command structure)	**Spell-out the Entire Phase** (no 'edge' that is part of the phase itself)	**Spell-out before Phase-external Merge** (no 'waiting' to spell-out until further structure is built)	**Dynamic Phases** (Phases are relational, and are not defined by the presence of specific heads)
Uriagereka (1999)	✓	✓	✓	✓
Grohmann (2000)	×	✓	×	✓
Chomsky (1) (2000)	×	×	✓	×
Chomsky (2) (2001)	×	×	×	×

Table 1: Domains of spell-out: syntax

Since the 1990's, many additions and modifications to the timing and identity of domains of spell-out in Phase Theory have been proposed, but the options in Table 1 still cover the variation in the literature up to today fairly well. Among other works that propose dynamic phases are Marušič (2005), Gallego (2005, 2007), Gallego and Uriagereka (2006, 2007), DenDikken (2006, 2007), Müller (2010), Richards (2011), Bobaljik and Wurmbrand (2013), and Bošković (2017).[8] Samuels (2009, 2012), Narita (2009b), Narita and Samuels (2009), Boeckx (2009), Newell (2008) and Johnson (2003) propose that Uriagereka's command chains and Chomsky's PIC2 are both active constraints on grammars (some of these incorporating the notion of combined spell-out of the phase head+complement for nested phases, not only for Uriagereka's left-branches). Among the proponents of static, Chomskian, phases the literature is split on whether they adhere to PIC1 (6) or to PIC2 (7). Representative proponents of PIC1 are Chomsky (2000, 2001), Seidl (2001, who also allows for non-phasal phonological domains), Legate (2003), Fox and Pesetsky (2005), Marvin (2002, 2013), Newell (2008), Kramer (2010), Müller (2010), Abels (2012), Bobaljik and Wurmbrand (2013), and D'Alessandro and Scheer (2015). Representative proponents of PIC2 are Chomsky (2001, and subsequent work), Kratzer and Selkirk (2007), Samuels (2009, 2012), Embick (2010, 2014), Dobashi (2003, 2009), Sato (2012), Embick (2010), Embick and Schwayder (2018). There are also many works within the phase literature that do not specifically state how they assume the timing of spell-out is determined. It is of interest here that the adherence to PIC1 or to PIC2 is not divided temporally. There has been a continuous divide in the literature throughout the lifespan of Phase Theory on the subject of whether a delay mechanism is built into the spell-out algorithm, and no definitive conclusion has yet been reached. The works mentioned in this paragraph all adhere in some way to the proposal in both versions of

[8] As mentioned previously, there are also works that propose a more radical view of cyclic spell-out, where interpretation occurs at every merge. These include Epstein and Seeley (2002) and all work in the framework of Nanosyntax (Baunaz et al. 2018). We will not consider these further here for reasons of space. We note that to capture certain types of allomorphy these systems must introduce the possibility of over-writing previously spelled-out domains, and therefore introduce further nuanced considerations of what domains the PIC might hold of. See Samuels (2012 and references therein) for arguments that spell-out must not occur at every merge.

the PIC that it is the complement of the phase head that is sent to spell-out, another important point of contention.

The majority of the literature on Phases assumes Chomsky's version of spell out, whereby the spell out domain of the phase is the complement of the phase head. Representative work (in addition to Chomsky's) includes Legate (2003), Kahnemuyipour (2004), Marantz (2007, 2013), Marvin (2002, 2013), Newell (2008, for vP and CP phases), Samuels (2009), Pak (2008), Embick (2010), Müller (2010), Compton and Pittman (2010), Bobaljik and Wurmbrand (2013), Dobashi (2003, 2009), Richards (2011), Sato (2012, for vP and CP phases), Cheng and Downing (2016), and Bošković (2017). It is of note, however, that a subset of the above adhere to the proposal that the first phase head does not trigger spell-out and therefore the most embedded phase does not spell out its complement independently (the work of Marantz (2007, 2013), Embick (2010), Marvin (2002) and Newell (2008 and subsequent work) for all little-x heads). There are, however, many current proposals that claim that the spell-out domain does not include an edge at all: spell-out targets the entire maximal projection of the phase. This includes Fox and Pesetsky (2005), Downing (2010), Johnson (2003), Sato (2012, only for left branches), and Ishihara (2007, who includes specifiers in A-positions in a spell-out domain, but not specifiers in A' positions) and Bošković, (2016). There are also those who argue for an intermediate position, where phase heads spell-out with their complements, but specifiers spell-out separately (e.g. Newell 2008, 2021 for small (little-x) phases; Kayne 2010; Kramer 2010; Sande et al 2020).

This variation in the literature is clearly relevant for work at the interface. Whether or not the head/edge of a phase undergoes phonological or semantic interpretation with its complement has an obvious impact on whether we conclude that phonological and semantic domains are isomorphic with syntactic phases. Phonologists working at the interface must stay abreast of relevant debates in the syntactic literature and motivate their choice of (and evidence for) the spell out algorithm they adhere to.

1.3 The syntactic domain of spell-out at a phase X+n

In the previous section we discussed the definition of the domain of spell out. A related question treats what is assumed to occur upon the interpretation of a Phase X+n that contains another Phase X. To see what is meant by this specifically, consider (8). Let us assume that the phase heads C^0 and v^0 spell out their complements. At the spell-out of CP, we have two logical options. Either the content of the spell-out domain of vP (8b) is within the computational domain of CP at spell out (8c) or, having already undergone interpretation, it is no longer actively considered (8d).

(8) a. [[Seonaid [likes [foraging VP] **vP**] TP] **CP**]
b. vP: transferred domain = VP = *foraging*
c. CP: transferred domain = TP including VP = *Seonaid likes foraging*
d. CP: transferred domain = TP not including VP = *Seonaid likes*

The standard view in the syntactic literature is that, assuming PIC_1 (6), the spell-out of the VP *foraging* is not visible/considered at the spell-out of CP's complement (TP). At the CP phase, *Seonaid likes* will be spelled out. Then, at a later point, the outputs of the various cycles of interpretation will be linearized, giving the spell-out domains as in (9).

(9) [[*Seonaid likes*] [*foraging*]]
The CP and vP are domains are not phonologically nested.

Although the majority of the work that assumes this partitioning of the spell-out domains focuses on syntax and not on phonology, some phonological work supports this type of derivation (e.g. Samuels 2009; Pak 2009; Compton and Pittman 2010). Pak (2009:19) dubs this the 'Holding bin model' of phasal spell-out. She compares this to what she calls the 'Continuous-feeding model', which holds that the spell-out of CP in (8) must contain the spell-out domain of vP (as in (8c) and (10), below). Evidence for this type of system is given when the items in the CP domain make crucial reference to items already spelled out in their complement. Works that argue for this type of model are (e.g.) Fox and Pesetsky (2005), Newell (2008, 2017a, 2021), Newell and Piggott (2014) and Sande et al. (2020).

(10) [*Seonaid likes* [*foraging*]]
The CP and vP are domains are phonologically nested.

There is also an argument in the literature for an intermediate position. Dobashi (2003, 2009) argues that if the domains of phases are non-overlapping, then PF will not be able to compute the linearization of separate spell-out domains. This is an issue, as it is generally assumed that once the phonology has computed the spell-out domain no syntactic information remains. If c-command (or some other information) is necessary to determine linearization, it is not clear how [*Seonaid likes*] and [*foraging*] are properly linearized in (9). A derivation like in (10) would solve what Dobashi dubs the Assembly Problem (see also the Address Problem in Uriagereka (2012)), although he offers an alternate solution. If each spell-out domain that undergoes linearization leaves the leftmost item unphonologised, it can be interpreted as part of the higher phase, as in (11).

(11) a. [[foraging for mushrooms VP] vP]
VP sent to spell-out. *for mushrooms* is spelled out. *foraging* remains *unphonologised* as it is the leftmost item in the VP.
b. [[Seonaid [likes [foraging for mushrooms VP] vP] TP] CP]
TP is sent to spell-out. *likes foraging* is spelled out. *Seonaid* remains *unphonologised* as it is the leftmost item in the TP.

This type of derivation can be seen as a phonological version of Chomsky's Phase Edge. As stated at the end of §1.1.2, the answers to these debates about the content of each spell out domain have important implications for what is happening at the syntax-phonology (and syntax-semantics) interface. Notions of 'visibility' and 'edge' become very relevant when building phonological analyses, as the phonology can only be sensitive to the properties of the items, both morphosyntactic and phonological, that it receives in a cycle.

1.4 Phase Impenetrability

This discussion leads us, finally, to the variation in proposals regarding (2d); Whether and how Phase Impenetrability holds. We must note that the Assembly Problem discussed in the previous section only arises if the PIC renders the spell-out domain of a phase invisible to further operations in the syntax and in the phonology. The majority opinion in the literature is that the PIC does hold in the syntax.

The arguments in favour of the PIC are as follows. First, there is the conceptual motivation in Chomsky's original work on phases. It is proposed that the PIC allows the speaker to 'forget' about previous cycles and that this lightens the processing load of linguistic computation. As far as I know, there have been no studies that specifically support this proposal or how it compares to the computational requirements imposed by phases themselves (e.g., reassembling the outputs of phases that must be held in short-term memory). Second, it is argued that movement to intermediate positions is motivated by the PIC. This argument runs as follows. Consider the sentence in (11), where unpronounced copies of the WH-word *what* are indicated in grey.

(11) [What did Seonaid [what find [what VP] vP] CP]

The movement of *what* from its base position to the intermediate position in Spec,vP is not motivated in the same way as its movement to Spec,CP is. The latter is necessary to check an unvalued [WH] feature on C^0 (or on *what*, depending on one's theory of feature-checking). The question is, what motivates the movement to Spec,vP? The PIC holds that intermediate movement must take place in order to avoid *what* being spelled out in VP. If *what* were to spell out in VP, then it would be invisible (per the PIC) and would

not be able to raise to Spec,CP to check the required [WH] feature. The fact that *what* does indeed raise to Spec,CP indicates that intermediate movement has indeed occurred (see Legate 2003, 2012, for example, for syntactic tests that support that this intermediate movement has taken place). In order to get *what* to Spec,vP, however, it is proposed that v^0 carries some sort of feature by virtue of being a phase head (an EPP/edge feature). It is this feature that locally motivates the movement of *what*. The movement of *what* is therefore doubly motivated: by the PIC and by the EPP/edge feature. Note, however, that the movement triggered by the EPP/edge feature is sufficient on its own to motivate the intermediate stage of movement.[9] The EPP/edge feature has the result of moving items out of the spell-out domain that would have caused problems were they to remain in the lower spell-out domain. The corollary of this is that it is very difficult to test whether the PIC itself has any effects. To find positive evidence for the PIC, one would have to argue that in a situation where the object stays low (and therefore is not targeted by the EPP feature) that its low position (and only its low position, rather than, say, intervention effects or other syntactic factors) causes it to be invisible to the higher syntax. I have found no arguments of this nature in the literature.[10] There is also a non-negligible literature containing positive arguments that the PIC does not hold in the syntax (e.g. Uriagereka 1999; Stepanov 2001; Grohmann 2003; Bobaljik and Wurmbrand 2005; Fox and Pesetsky 2005; Bošković 2007, 2014; Kilbourne-Ceron et al 2014, Keine 2017; Newell 2017a; Witkoś 2021; Sande 2020). Arguments against the PIC in these works include evidence for movement out of phases after spell-out, agreement with items inside spell-out domains, and reference to phonological material in an embedded spell-out domain.

Determining whether the PIC is an active constraint on computation is clearly very important for the discussion of Phases and Phonology. It is crucial to know what material is visible from one phase to the next in order to be able to offer correct analyses of phonological processes. While a few articles argue explicitly for a complete PIC at PF (Harizanov and Gribanova 2017, 2019, Kramer 2010), others argue that there is positive evidence refuting a phonological PIC (Fox and Pesetsky 2005; Newell 2008, 2017a, 2021; Kilbourne-Ceron et al 2014; Embick and Shwayder 2018; Sande 2020, 2021, and Sande et al. 2020), and still others argue that phonological rules are variably subject to the PIC (cyclic rules are, while post-cyclic rules are not) (Marvin 2002, 2013; Samuels 2009; Pak 2008; Embick 2010, 2013), or that the PIC is itself parameterized within and across

[9] Whether this is a well-motivated, non-circular, reason for movement is another question, beyond the scope of this chapter.

[10] Note that problems for confirming the effects of the PIC would include the relation between A (in phase X+n) and YP (in phase X) being blocked by the assignment to YP of some feature during spell-out that would make it an illicit goal for A. For example, if YP has an unvalued feature, but somehow was not attracted to the edge of phase X, spell-out could force said feature to be assigned a default value. If A probes for an unvalued feature, YP would no longer be a licit target, but this blocking of the interaction of A and YP would not be attributable to the invisibility of YP/the PIC.

languages (D'Alessandro and Scheer 2015). The motivated arguments *against* the PIC holding in the phonology are clear and convincing. It is also important to note that the PIC itself was proposed as a restriction on the *syntactic module* and was imported into the phonological module by most without serious discussion or motivation. The history of work on phonological cyclicity makes it clear that nested phonological domains lose morpho-syntactic information during computation (e.g. Bracket Erasure in Chomsky and Halle 1968 and much subsequent phonological work), and that phonological items in separate domains will often remain separate phonologically on the surface (e.g. van Oostendoorp (1999); Newell and Piggott (2014)'s *Prosodic Persistence*). But there is also abundant strong evidence that phonological items introduced in later cycles have access to items computed in previous cycles. Among these are all of the phenomena discussed in the work of proponents of a variable PIC cited above, for example, the association of tone and other sub-segmental morphemes across phases (ex. Sande et al. 2020), the resyllabification of outer affixes inside an interior cycle (Newell and Piggott 2014's *Phonological Merger*, Newell 2021a,b; Kean's (1974) translation of Strict Cyclicity to phonological domains, and countless others), or infixation into a previously spelled-out domain (e.g., Kalin 2022) See Embick (2013) and Newell (2017a) for collections of arguments against the PIC in the phonology and elsewhere.

To sum up the possibilities in the literature with regard to the possible effects of phases within the PF module, consider Table 2, below.

What part of the phase undergoes spell-out?	What is visible in PF at spell-out?	Is the PIC active in the phonology?
Complement of the phase head	Nested phases are not visible	Yes
Phase head and its complement	Nested phases are visible	No
Phase head, its complement, and its edge	The edge of the nested phase is visible	Variably

Table 2: Domains of spell-out: phonology

Table 2 should be read as though the options in each column can be mixed and matched. Although theories that assume nested phases to be invisible for the computation of later syntactic phases generally assume the PIC to be active in the phonology, none of the above options is logically implied by any other.

1.5 Concluding remarks on the definition and properties of phases

The PF variation in Table 2 combined with the syntactic variation in Table 1 leads to a gross lack of consensus in the literature on topics relevant to this chapter: *Phases and Phonology*. In both the syntactic and phonological literature there are dominant views, namely: (A) It is the complement of the phase head that undergoes spell out (except in

the case of the most embedded phase in a structure), and (B) The PIC holds in some way in both the syntax and the phonology. A close reading of the literature, however, demonstrates that much of the non-foundational work on phases assumes these views without detailed discussion. Much more pointed work needs to be done to motivate or refute the variations options in Tables 1 and 2, or to account for why and when we see variation in phasal behaviour both within and across languages. One of the ways which we can gather data relevant to phase theory is by examining the phonology-syntax interface. This is what we will do in the following section, where we will turn to an examination of a dataset, Italian s-voicing, to highlight how the different versions of phasehood impact phonological analyses.

2. Data analysis: Phases and Phonology

In this section we examine some variations on phase-based phonological analyses. In addition to phasal spell-out, all phonological theories make assumptions about the phonological marking of interpreted domains. We will begin with an overview of these phonological tools and assumptions in §2.1-§2.3. In §2.4 will then introduce a dataset of s-voicing in Italian, and in §2.5 we will discuss the classic analysis of the data in Nespor & Vogel (1986), updated to take phases into consideration. In §3 we will then use the same to exemplify the details representative of each of the models in presented in a phase-based system in §1.

2.1 Phonological Interface Theories: The Phase

This section includes discussion of phonological interface theories as they have emerged during and after the introduction of phases. The reader is referred to Scheer (2011) for a comprehensive overview of phonological interface theories up to Phase theory. Prominent concepts that are still relevant to the conversation therein include inside-out cycles of phonological rule application in SPE (Chomsky and Halle 1968), the Strict Cycle Condition (Chomsky 1973; Kean 1974; Mascaró 1976; Kiparsky 1982; Halle and Vergnaud 1987; and Kaye 1992, 1995. All provide slightly different versions.), and Prince's (1985) Free Element Condition, along with many independently proposed notions of Structure Preservation. The interaction between cyclicity and phonological activity has been studied since long before phases and the PIC emerged. The most prominent questions that have been consistently asked within the phonological module itself are as follows (relativized to phase theory).

(12) Questions of visibility:

a. Is the output of phonological interpretation at phase X visible at phase X+1?

ai. If no, how do we explain operations that span phases?

aii. If yes, can structure built at phase X be altered at phase X+1?

Questions of representation:

b. Are the outputs of different phases organized into a cohesive structure by the phonology?

bi. If so, what are the properties of this structure?

bii. If not, how is the final linearized form (in)sensitive to phase edges?

Questions of computation:

c. Are distinct phases imbued with distinct phonological grammars?

ci. If no, how can we explain what appear to be distinct phonological behaviour within distinct phases?

cii. If yes, is the grammatical variation across cyclic grammars constrained?

Let us consider each of the variables in (12) in the following subsections.

2.2 On phonological visibility across cycles

The questions in (12a) examine whether the output of phonological interpretation at phase X is visible at phase X+n, and if so, how is that visibility constrained (if it is).

All theories of phonological computation must account for phrase-level phonological phenomena (e.g., tone spreading, liaison, flapping). Therefore, all theories must answer 'yes' in at least some cases to the question in (12a): a subset of the output of phonological interpretation at phase X *is* visible at phase X+n. The data are clear: structure introduced in a phase X+n has access at some point to the output of cycle X. This does not entail that all phonological operations at phase X+n must reference the output of phase X, only that some are able to. Here, and in the following sections, we will therefore only look at processes that do not cross word and phrase boundaries in the languages where they occur in order to compare the details of different explanations in the literature for the invisibility of phonological structure. This allows us to compare analyses in domains that are potentially subject to a constraint like the PIC, domains in which what have been called *cyclic* phonological rules apply.

A nice demonstration of how cyclic rules must have access to the output of previous phases comes from Newell and Piggott (2014). In Ojibwe, the default is for phonological material within the vP, aP and CP domains to be syllabified and footed separately, even though together they form a single domain for main stress (what PH accounts would call

a PW). This can be seen clearly in (13a), as the aP modifier [(bí)] is footed separately from what precedes and follows it, and in both (13a) and (13b) by the fact that vowel hiatus is neither resolved between the tense morpheme and the aP modifier, nor between the aP modifier and the verb.[11]

(13) a. [gi: [bi $_{aP}$] [iʒa: $_{vP}$] $_{CP}$] (gì:)(bí)(iʒà:)
Past-Towards.Speaker-go
'He came.'

b. [gi: [ini $_{aP}$] [a:gam-ose: $_{vP}$] $_{CP}$] (gì:)(inì)(á:)(gamò)(sè:)
Past-Away-snowshoe-walk
'He walked there in snowshoes.'

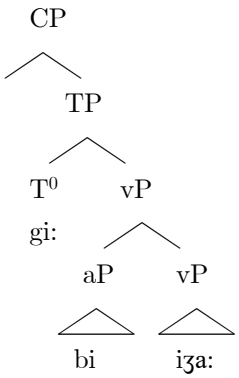
In contrast (14) demonstrates an example where both footing and hiatus resolution apply across a phase boundary. The future marker *ga* (in T^0, syntactically on par with *gi:* in (13b)), being too small to constitute a foot on its own (monomoraic), re-syllabifies with the string to its right, triggering refooting of the previous cycle of phonological computation, and hiatus resolution by epenthesis.

(14) [ga [ini $_{aP}$] [a:gam-ose: $_{vP}$] $_{CP}$] **(gadì)(nì)**(á:)(gamò)(sè:)
Future-Away-snowshoe-walk
'He will walk there in snowshoes.'

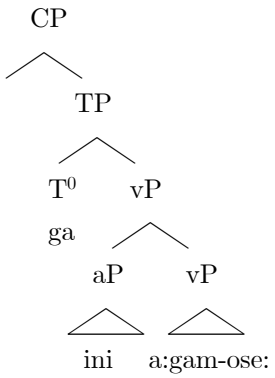
Two aspects of the above repair operations are important to note. The first is that refooting is not triggered across the entire string, but only within the domain that had been computed at aP. Examples like (14) demonstrate this very clearly, as they are the only types of derivations in Ojibwe in which a degenerate foot (nì) is permitted word-medially. The second is that the monomoraic tense marker *ga* refoots, while the monomoraic modifier *bi* in (13a) does not. The reason for this distinction is proposed to be structural. Consider the following (simplified) structures.

[11] It is important to note that in Ojibwe that long vowels may be deleted when hiatus is violated within a phase.

(15) a.



b.



In (15a) the modifier *bi* is the phonological output of the aP phase. At the moment in which it undergoes phonological computation, whether this is due to its containing a phase head or by its being a complex left-branch, it has no embedded phase into which it might merge phonologically. In other words, in the case of the aP phase, the 'holding bin model' and the 'continuous-feeding model' of spell-out make the same predictions. The syllabification and footing algorithms operative in Ojibwe clearly allow for the creation of degenerate feet at the right edge of a domain iff no other option is available (see 14b). The aP is only merged to the vP after it undergoes interpretation, and after it has undergone footing. At this point of the derivation, it no longer has any need to examine its environment to see if it might be able to form part of a licit foot: it already does form a licit foot. In other words, after undergoing phonological computation, the phonological structure of any morphemes in the aP have been modified: they now have foot-structure that was not present their underlying representations. In (15b), however, the future morpheme *ga* in T^0 is part of the phase triggered by CP. If one assumes that the entire complement of CP is visible at spell out of this phase (the continuous-feeding model), then *ga* has access to the phonological material in its complement domain *before* it undergoes footing. It foots with the string to its right to avoid the creation of a degenerate foot only because the material to its right is available within its cycle. The holding-bin model, on the other hand, makes the wrong prediction in this case, predicting that *ga* will undergo footing independently, just as *bi* did.

If the above analysis is correct, then we have answers to the questions of visibility in (12a). Yes, the output of phonological interpretation at phase X visible at phase X+n. Here we have positive evidence that phase X is visible when it is *contained within* phase X+n. We also have evidence for a positive answer to (12aii); yes, structure that is built at phase X can be altered at phase X+n. Here footing (and therefore the stress pattern) has been altered in the aP phase after the incorporation of the tense morpheme. We additionally have evidence for purely additive phonological operations applying in this altered phase in the form of epenthesis (14). Importantly, in addition to the above evidence of structural visibility and modification in the configuration in (15b), we also have evidence

for the visibility of phases that are not in an embedding relation. Note that in (14) there is a single main stress within the entire string, indicating that the main stress algorithm is sensitive to metrical prominence across the output of phases, after linearization. As mentioned in Samuels (2009), the computation of main stress can be seen as adding structure after linearization, rather than necessitating modification of previously computed structure. It does require though that the outputs of distinct phases be visible to one another.

We can therefore conclude that any phonological theory that incorporates some version of the Phase Impenetrability Condition (ex. Marvin 2002, Samuels 2009, Pak 2009, d'Alessandro and Scheer 2015) can only do so selectively. Marvin, Samuels and Pak propose that non-cyclic rules apply across phases, but that cyclic rules do not (following a division between blocs of rules promoted within the framework of Lexical Phonology and Morphology (Kiparsky 1982, Mohannan 1982)). Which rules are cyclic or non-cyclic in a given language may be language specific. Another option is taken by d'Alessandro and Scheer. They propose that the PIC is not relativized to Cyclic/Non-Cyclic blocks of rules, but rather to the syntactic phases themselves; whether a particular phase triggers the PIC in a given language is a lexical property of the phase head. They do, however, have to revert to a definition of PIC sensitivity that parallels those in Marvin, Samuels, and Pak's work, as they note that this phase-head parametrization is not fine-grained enough to capture the variation seen across and within languages and propose that the PIC must be relativized to each rule in each language. This then can be recast as a language having cyclic and non-cyclic rules, and effectively eliminates any predictive power of the PIC. Like the Edge features discussed in §1.1.4, the concept of cyclic vs non-cyclic blocs of rules constitutes an independent explanation for phenomena that are also attributed to the PIC: If a particular cyclic operation does not apply in phase X+n because it is absent from the phonological grammar of X+n then it will appear that the inner cycle is invisible for this operation.

Another way in which many current theories incorporate some version of the PIC into the computation is via the promotion of Faithfulness constraints. Virtually all current iterations of Optimality Theory (OT) propose that the derivation is effected cyclically (popular offshoots of classic OT being Stratal Optimality Theory (Bermúdez-Otero 2018), Harmonic Serialism (McCarthy 2010), OT-CC (McCarthy 2007), etc.).[12] OT grammars are proposed to contain Faithfulness constraints that mitigate against the modification of

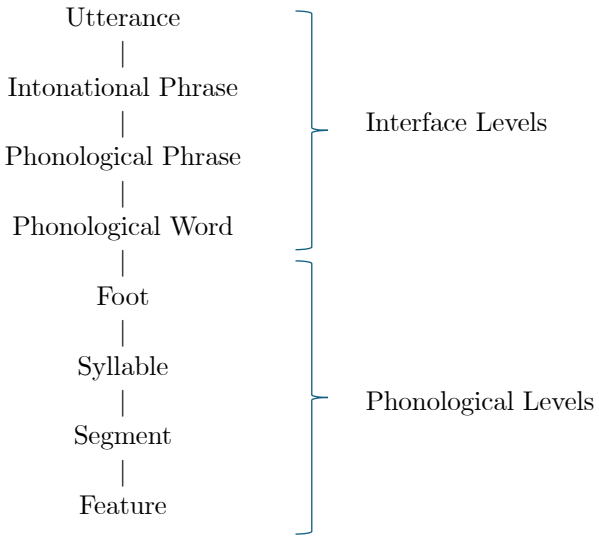
[12] This is opposed to the original formulation of OT in which an attempt was made to eliminate derivational cyclicity (Prince & Smolensky 1993). The fact that the vast majority of researchers were forced to reject the strong hypothesis that the phonological derivation was surface-oriented and non-cyclic should have been the end of the OT project, in my opinion, as OT was originally crucially based in the notion that intermediate forms were not cognitive objects (an extension of Connectionism (Legendre et al 1990)). Other major motivations for OT are the proposed existence of conspiracies (Kisseberth 1970) and The Emergence of the Unmarked (McCarthy and Prince 1994). Newell (forthcoming) proposes that both of these phenomena emerge from independently necessary operations of structure-building rather than from constraint-ranking.

structure. Assuming a system like Stratal OT where there are 3 cycles of phonological interpretation, Faithfulness constraints at Stratum 2 (word) may be ranked in the same place that they were ranked in Stratum 1 (stem), or they may be ranked higher, but they may not be ranked lower at Stratum 2 than they were at Stratum 1. What this restriction on re-ranking accomplishes is that structures that emerge in Stratum 1 become more (but not less) resistant to being altered at Stratum 2. This part of the discussion overlaps with the question asked in (12c); whether different phases contain different phonological grammars, which we will return to below. This reranking is relevant for our discussion of the visibility of previous cycles, it is clear that visibility across cycles is required in order for OT Faithfulness constraints at Cycle 2 to prevent the modification of structure built at Cycle 1 (or for highly ranked Markedness constraints in Cycle 2 to modify structure that emerges from Cycle 1). If the output of the computation at cycle 1 were invisible, Faithfulness constraints would have nothing to be faithful to. It is important to note, however, that not all proponents of cyclic OT theories attribute phonological cyclicity to phases; some do, and some do not. For example, SOT argues that phases cannot be the source of phonological cyclicity (Bermúdez-Otero 2018), while Sande et al.'s Derivation by P(h)rase (2020) proposes OT cycles are uniquely triggered by syntactic phases. Frameworks that do not appeal to phases to define cyclic domains will more often than not appeal to representational mechanisms for distinguishing subparts of a phonological derivation using the Prosodic Hierarchy, which we turn to in the following section.

2.3 Questions of representation

When discussing domain visibility, we must also discuss phonological representation. Representation can be thought of as referring to two classes of phonological objects. Consider a typical breakdown of the Prosodic Hierarchy:

(16)



The *Phonological Levels* in (16) are those that are native to the phonological module: these pieces of phonological structure make no reference to the interface, and their size and behaviour are determined independently of the interface with the morpho-syntax. The *Interface Levels* in (16) are proposed in the Prosodic Phonology literature to be phonological translations of the syntactic structure (e.g., PW ⇔ X^0 and Ph ⇔ XP). These levels are a popular competitor for phase-based phonological domain formation in the literature. Prosodic Phonology is a strictly representational theory and therefore answers questions (12a) and (12b) with reference to the same phonological tools.

The Prosodic Hierarchy has been the representational tool most commonly used by theoretical phonologists for delimiting phonological domains since the 80's (pre-phases) and phonologists who employ it have variously linked its construction to derivation by Phase. For example, Guliz 2024, Kratzer and Selkirk 2020, and Bermudez-Otero 2016 claim that the PH is determined by properties of the syntactic structure, but specifically *not* by phases, while Kratzer and Selkirk (2007) allow for a role for phases in domain delimitation, and Sande et al (2020) propose that phasal spell-out determines the domains of the constituents of the Prosodic Hierarchy. Interestingly, the Prosodic Hierarchy does not itself, as a structural representation, include a mechanism that allows it to render smaller domains invisible or more difficult to modify at later stages of the derivation. In this way it is different from the PIC or the promotion of Faithfulness constraints. If the Prosodic Hierarchy is appealed to within a Rule-Based or Constraint-Based phonological framework then the domain of application of each rule/constraint can be a part of its specification (e.g., /t/ → [ʃ] / __ i ⌋$_{PW}$).[13] This allows for the representational properties of the PH to determine distinct behaviours of particular phonological operations, where

[13] See the various chapters on the PF interface in Rule-Based Phonology (Newell 2018), Optimality Theory (Bermúdez-Otero 2018), and Government Phonology (Scheer and Cyran 2018) in Hannahs and Bosch (2018) for more relevant discussions of the interface.

the rule just stated will not apply if /t/ and /i/ are separated by a PW boundary. Both rule-based and constraint-based systems also allow for a procedural impact of the Prosodic Hierarchy, whereby the PW or the PPh may be associated with independent cycles of computation (cyclic OT) or ordering/subset of rules (Lexical Phonology and Morphology). There is a general consensus that larger phonological domains should be 'stronger' and block more phonological operations than smaller domains, but this notion is not always implemented in practice (e.g., Lee and Selkirk (2022), where Utterances do not block tone spreading, but smaller Prosodic Phrases do), and as stated above, strength/weakness is not logically entailed by the PH system itself. Bermudez-Otero (2015) codifies part of this strength pattern as the Russian Doll Theorem, which holds that a rule that applies within a smaller domain, once turned off in a larger domain, will not then turn back on in an even larger domain, mirroring the effect of rules being blocked in certain domains.[14]

Representational alternatives to the Prosodic hierarchy for marking interface domains are few. Within CVCV phonology (Lowenstamm 1996, Scheer 2004), a branch of Government Phonology (Kaye et al 1985), it has been proposed that the left edge (but not the right edge) of domains of phonological computation, phases, are marked with empty syllabic space (Szigetvári (1999), Pagliano (2003), Seigneur-Froli (2003, 2006), Balogné-Bérces (2004, 2005), Kula et Marten (2009), Scheer (2000, 2004, 2008, 2009a,c), Ségéral et Scheer (2008b), Sanoudaki (2010).[15,16] In CVCV Phonology empty syllabic space is a CV-sequence on the timing tier (which is in some ways parallel to an empty syllable or a mora). In Newell and Scheer (2017) (briefly written up in Newell and Sailor in press) it is demonstrated how the left-edge CV can block the hiatus resolution in Ojibwe discussed above. This empty syllabic space, however, has no special properties that allow it to block phonological rules in general; it does not induce a phonological PIC. Empty syllabic space has the regular properties ascribed in the literature to such a structure; it offers a docking site for spreading (triggering a phonological operation) or may disrupt linear locality (blocking a phonological operation that depends on strict adjacency). A third representational tool that phonology has recourse to in order to derive generalizations attributed to the PIC is that of phonological structure-building in general. The Free Element Condition (Prince 1985; Halle and Kenstowicz 1991) is an example of this. The FEC regulated the modification of prosodic (syllabic and metrical) structure that was built on a previous cycle; only objects that had not undergone the relevant computation in a previous cycle were accessible in the next (e.g., only extrametrical syllables could be metrified on a subsequent cycle). This regulation was subject to parametrization (Steriade 1988) and therefore effected similar amounts of structure

[14] See Newell (2023) for arguments that this pattern is epiphenomenal.

[15] For an overview of CVCV phonology see Scheer (2004, 2015).

[16] McCarthy and Prince (1993) demonstrate that there is a quasi-universal tendency for the left edge of phonological domains to be aligned with morphosyntactic domains, while this tendency is very much weaker for the right edge. Alignment constraints in OT, the tool they use to capture this tendency, do not make any real predictions regarding why this should be.

preservation as does the promotion of Faithfulness constraints in OT. But there is one way in which structure-building can have the effect of blocking rule/constraint application in a very simple way that applies similarly across languages and was previewed above in the discussion of Ojibwe footing (see e.g., Kiparsky 1985, Myers 1991, Ito & Mester 1995, Honeybone 2005). The effect of phonological structure-building amounts to an application of the Elsewhere Principle. Consider the simplified hiatus resolution rule in (16).

(16) VV → VCV

This rule references segmental information only. In the strictest interpretation of (16), it therefore simply will not apply to a more specific environment, like that in (17).

(17)
```
σ   σ
|   |
N   N
|   |
V   V
```

While (16) applies to unsyllabified VV sequences, (17) contains a syllabified sequence. The prediction of structure building in general is that the effect of the addition of structure will bleed the application of any general rules in the grammar of a language. In effect, it does the same thing as the promotion of Faithfulness constraints, or the application of the Free Element Condition without needing to appeal to either. This type of blocking mechanism has been appealed to in Newell (2021a, 2023, in prep) and various works throughout the phonological literature that appeal to phenomena such as structure preservation, geminate integrity, and Strict Cyclicity. Importantly though, the presence of a general rule cannot imply the absence of a more specific rule within a grammar; nothing prevents a language from resolving hiatus (for example) in different ways, or in an identical manner, both within and across phases.

In sum, every representational theory of phonology on the market can restrict the application of rules/constraints to specific phonological environments, but none independently derive the PIC. In OT, even if constraints may be promoted, they remain violable. The Prosodic Hierarchy can be referenced in rules or constraints, or not, as determined by the grammar of a language. The initial CV may be inserted at the left-edge of a phase, or not. And finally, more or less structure may be referenced in the specifications of a rule or constraint giving way to elsewhere condition effects, or not.

2.4 Phonological representation and Italian prefixation

Now that we have laid out all of the tools that are relevant for analysing a pattern within a phase-based framework, let us look carefully at how different systems treat a single

dataset: Italian intervocalic s-voicing. We begin, of necessity, with the assumption that phases do indeed drive cyclic interpretation. The phenomenon of Italian s-voicing offers a nuanced pattern that permits a detailed comparison of distinct approaches to phasal spell out. It demonstrates sensitivity to prefixation vs. suffixation and to the consonant vs. vowel-final status among prefixes. Prefixes have the behaviour of complex left-branches/adjuncts and therefore there is a morphosyntactic component to the variation we will see below. Additionally, the variation caused by the consonant-final vs. vowel-final properties of prefixes, being a strictly phonological variable, allows for a discussion of non-interface phonological requirements on the application of s-voicing. For details on dialect variation and on previous analyses, the reader is referred to Nespor and Vogel (1986), Krämer (2003, 2005, 2009), Peperkamp (1994), and van Oostendorp (1999). Here we discuss data representative of the northern Lombardian dialect.

In brief, the s-voicing pattern is as follows (Nespor and Vogel 1986): s-voicing occurs intervocalically within a morpheme (18a), between suffixes and the base they attach to (18b), between semantically non-compositional prefixes and their bases (18c), and between s-final semantically compositional prefixes and their bases (18d). It does not occur intervocalically between members of a compound (19a), between vowel-final semantically-compositional prefixes and an s-initial base (19b), between pronominal clitics and their hosts (19c,d), or between words (19e).

(18)	a.	a[z]ola	'buttonhole'	(125)
	b.	ficca-na[z]-i snoop-nose-PL	'busybodies'	(125)
	c.	pre[z]entire pre-sense	'to have a presentiment'	(128)
	d.	di[z]-uguale dis-equal	'unequal'	(128)

(19)	a.	tocca-[s]ana all-heathy	'cure-all'	(125)
	b.	pre-[s]entire pre-sense	'toe hear in advance'	(128)
	c.	telefonati [s]i having.called 3.RECIP	'having called each-other'	(125)
	d.	lo [s]apevo 3.ACC know.1SG	'(I) knew it'	(125)
	e.	la [s]irena	'the siren'	(125)

Nespor and Vogel (1986:126) discuss how the Italian data is analytically interesting in that it demonstrates the classic pattern of a Bracketing Paradox.[17] Assuming that intervocalic s-voicing in Italian must occur internal to a specific domain (e.g. the Prosodic Word) they expect that an /s/ that is voiced in domain X should also undergo voicing in domain X-1. The syntactic structure of *ri/s/uddivi/z/ione* 'resubdivision$_N$' being that in (20a), where n=X and v=X-1, it is therefore surprising that the phonological domains appear to be as in (20b).[18] In */s/uddivi/z/ione*, where s-voicing occurs between the root */s/uddivi/s/* and the outer nominal morpheme *-ione* (in n=X), but not between the root and the verbal prefix *ri-* (in v=X-1). This is a classic example of purported non-isomorphism between morpho-syntactic and phonological structure; exactly the kind of data that is used to argue for the necessity of a purely phonological constituent structure that is distinct from that in the morphosyntax, like the Prosodic Hierarchy.

(20) a. [[ri-**s**udivi**z** $_v$]ione $_n$] b. [ri [**s**udivi**z**-ione]]

The above patterns can be explained in phase-based terms as follows. Each member of a compound and each stem (where stem = the root and its first category defining head) constitutes its own phase. Therefore, little-x structures (n^0, a^0, v^0) are phases in Italian, wherein the derivational heads (suffixes) are inside the same domains as their complements (recall the discussion in §1.2 of how roots do not undergo interpretation alone). The clitics and outer affixes in (19) emerge in independent phases. This, on its face, predicts that all affixes outside the first little-*x* phase should behave as if they are in a separate phonological domain/phase from their base. Nonetheless, all suffixes, as well as all C-final prefixes, even if they are not merged directly to the root, somehow find themselves merging phonologically with their bases and triggering s-voicing. In a similar fashion to the Ojibwe hiatus data in (14), this demonstrates that the PIC does not block s-voicing in the phonology of Italian (see detailed derivations in the following subsections).

As Nespor and Vogel (and the subsequent literature) clearly demonstrate, the difference between the behaviour of the two prefixes *dis-* (18b) and *pre-* (19c) cannot be derived by proposing that they have distinct morpho-syntactic structures. They are both what would be considered Level 2 prefixes in the terminology of Lexical Phonology and Morphology; they are semantically isolable and may emerge outside other semantically and phonologically isolable prefixes (e.g. *dis-pre-munir-si* 'dis-pre-arm-oneself' (Nespor and Vogel:128)). What needs to be accounted for, therefore, is (i) why the suffix in (20b) is 'closer' to the base phonologically than the prefix and (ii) why a consonant-final prefix

[17] See Newell (2019) for an overview of the history of Bracketing Paradoxes, and Newell (2021b) for an argument from Bracketing Paradoxes that phonological representations must be linear, rather than hierarchical.

[18] The selectional restrictions of *ri-* do not allow for it to merge to the nominal *suddivisione*. It must merge to a verbal base, and therefore must be syntactically interior to the nominal suffix.

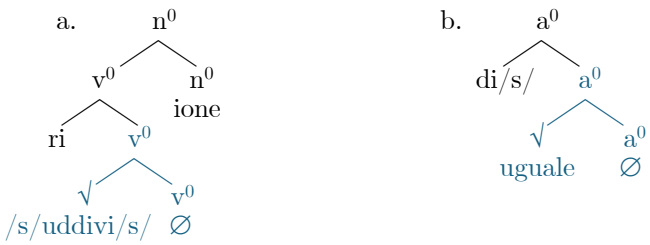
behaves as though it is 'closer' to its base phonologically (18d) than a morphosyntactically parallel vowel-final prefix (20/19c).

The following sections will detail the standard Prosodic Phonology account of the Italian s-voicing data (§3.1), varios PIC-type accounts of the same (§3.2), and finally a CVCV Phonology/No-PIC account (§3.3). Section 3.4 will then conclude our dataset comparison, contrasting and comparing these approaches.

2.5 The Prosodic Hierarchy account of Italian s-voicing

\a.

(21)



In (21a), neither /s/ in *suddivis* is intervocalic within the first phase (22a). The derivation then proceeds in two more phases, assuming that adjuncts are interpreted separately from the bases with which they merge (22b), following the discussion of left branches in §1.2. They are therefore phonologically merged and linearized with their base at the next phase, (22c). Nespor and Vogel propose that vowel-final semantically-analysable prefixes are lexicalized as Prosodic Words (22b). To be lexicalized as a PW means that the PW structure associated with these prefixes is part of their underlying structure, rather than emerging from the cyclic interpretation as in (22). This will become important when we discuss consonant-final prefixes, as seen in (21b).

(22) a. /s/uddivi/s/ → [s]uddivi[s]
b. [ri $_{PW}$]
c. [ri $_{PW}$] | [s]uddivi[s] | ione

Following the tenets of Prosodic Phonology, Nespor and Vogel propose that phonological hierarchical structure is independent of the syntactic structure. This allows them to explain how (22c) translates to (20b) as follows. Lexical roots emerge as Phonological Words. A translation rule such as *Lexical* $X^0 \Leftrightarrow PW$ would be consistent with general accounts of the creation of Phonological Words in either rule-based or optimality theoretic frameworks (e.g., in the analyses of Peperkamp 1994, van Oostendorp 1999, Kramer 2003, 2005, 2009). According to Nespor and Vogel, no affixes but vowel-final compositional prefixes are lexicalized with prosodic structure. The output of (22c) in the phonology is therefore as in (23a) if the suffix is immediately subsumed in the PW of the lexical root in the computations of the phase in (22c).

(23) a. [ri $_{PW}$] [[s]uddivi[z]ione $_{PW}$] b. [ri $_{PW}$] [[s]uddivi[s] $_{PW}$] ione

If the output of (22c) is as in (23b), and assuming all morphemes must emerge as part of some prosodic structure, the suffix in (23b) will undergo a readjustment that incorporates it into the PW to its left, giving a structure indistinguishable from (23a). This kind of readjustment is independently motivated in various accounts and will be necessary to explain the distinct phonological structure of (21b) in (24).

As s-voicing occurs within a PW in the Prosodic Phonology account, only the second /s/ is subject to the rule. Again, incorporation of the outer suffix into the PW of its base demonstrates that the PIC cannot be operative in any relevant way in this type of analysis. Readjustment of prosodic structure has been a permitted operation in Prosodic Phonology since its (pre-phase) inception.

The derivation of (21b) is therefore as in (24a), after the independent spell-out of the first phase, the spell-out of the prefix/adjunct, and their subsequent linearization. In (24b) the prefix, which is not proposed to be lexicalized with PW structure, merges into the domain to its right, and s-voicing applies. Consonant-final prefixes are proposed by Nespor and Vogel to not come with lexicalized PW structure. This is argued to be due to their divergence from the normal PW structure of Italian, a language in which C-final words are exceedingly rare, and are often borrowings (e.g., *gas*).

(24) a. di/s/ [uguale $_{PW}$]
b. [di/s/uguale $_{PW}$] → [di[z]uguale $_{PW}$]

The comparison of the derivations in (22-23) and (24) therefore must conclude that the independent interpretation of the prefixes does not itself result in the projection of a PW around the prefix, as then neither V-final nor C-final prefixes would incorporate. It is not clear, however, how to prevent the projection of a PW in the derivation of the C-final prefixes. What is required to prevent the projection of PWs around affixes is a non-modular diacritic in the phonological computation: only cycles containing a 'lexical' morpheme project a PW, where 'lexical' is clearly not part of the phonological computational vocabulary.

The Prosodic Phonology account can be summed up as follows. Lexical domains project Prosodic Words. Affixes generally do not and are incorporated into the Prosodic structure that they merge with. But, in Italian, vowel-final semantically independent prefixes come with Prosodic Word structure that is part of their lexical entries. They are the only affixes that do not trigger s-voicing, as s-voicing only applies if both vowels that flank the /s/ are in the same PW as /s/ at the end of the derivation. One point to keep in mind while reading the sections below, however, is that the PW structure that Nespor and Vogel propose to explain the distinction between V- and C-final prefixes is not the

only way in which this distinction can be captured (see Krämer 2009 for arguments that the PW does no explanatory work in the phonology of Italian).

The incorporation operation discussed above allows for the phonological unification of the output of two non-nested phases, neither of which contain the other in the syntactic structure, an option that was not taken in the hiatus-resolution system of Ojibwe. This demonstrates that segmental/syllabic level operations, in addition to metrical operations, may be visible to each other regardless of the syntactic relations that hold between them.

3. Phases, the PIC, and Italian s-voicing

In the previous section we updated Nespor and Vogel's account by adding phase theoretic cyclic spell out into the mix. But, as we saw in §1, there is a large amount of variation in how phases are implemented in the literature. In the following sections I will consider three modern types of phase-based systems representative of many of the variants discussed in §1. These all hold the PIC to be operative, and I will demonstrate how they fare with the Italian data. The first will be rejected immediately. It consists of a system wherein the PIC holds absolutely. Note that very few researchers who work at the interface between phonology and syntax hold this position, for reasons that are already clear. I will then discuss a hybrid system, that of Samuels (2009), where cyclic rules are subject to the PIC2, but post-cyclic rules are not. We will then turn to d'Alessandro and Scheer (2015)'s Modular PIC, where phonological phasehood may vary and distinct points in the derivation. Each of these will be shown to raise questions regarding their ability to coherently capture relevant data. Finally, I will discuss my own phase-based framework that holds the effects attributed to the PIC to be emergent. We will see that, because cyclic phonological rules may impact domains that have previously undergone spell-out, this type of system fares best among the options considered here. In the conclusion to this section, we will then discuss what the s-voicing pattern tells us about the grand scheme of phase-based phonological frameworks.

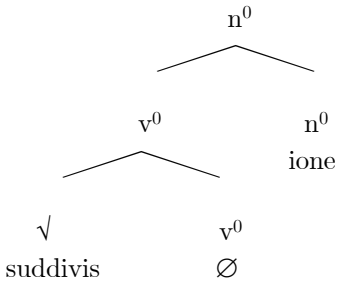
3.1 Absolute PIC

Let us first consider a phonological derivation wherein the PIC holds absolutely, in the manner that it is proposed to hold in the syntax (Harizanov and Gribanova 2019; Kramer 2010). The prediction would be that phonological domains would never undergo readjustment operations like the ones discussed above for Italian and Ojibwe. Recall the following phono-syntactic paradox from (20):

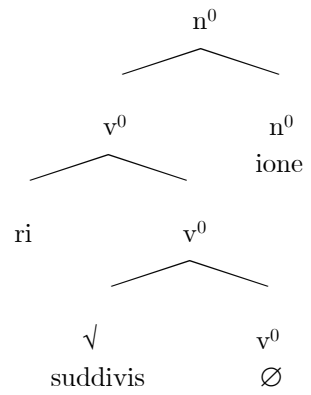
(25) a. [[ri-**s**udiviz$_{\text{v}}$]ione$_{\text{n}}$] b. [[ri] [**s**udiviz-ione]]

If the phonology gives us incontrovertible evidence for syntactic domains, and the PIC holds absolutely, (25a) cannot be the syntactic structure of *risuddivisione*. It must, rather,

have the structure in (25b). The structure in (25b), however poses problems both syntactically and semantically; ri- selects for verbs, not nouns, and therefore cannot merge to *suddivisione*, and *risuddivisione* means 'the act of resubdividing' not 'another subdivision', demonstrating that *-ione* has scope over *ri-*. There is a way, however, to salvage the proposal that the syntactic structure mirrors the phonological structure in (25). This is possible only if, in keeping with the semantics and selectional restrictions of the final construction, prefixes are morphosyntatic adjuncts that are merged countercyclically (as proposed in Newell (2008)).[19] The derivation of (25) will therefore be effected in (at least) 3 steps. In (26a) we interpret the adjunct prefix separately, before it undergoes merger. In (26b) we interpret the root and all of its affixes (abstracting away from some internal structure). In (26c) we linearize the two previously computed cycles after late-adjunction of the prefix. As all overt morphemes have previously undergone phonological computation and nothing phonological is required of their output structures beyond linearization the internal structures of the different cycles do not need to interact.

(26)	Morphosyntax	Phonology
a.	ri	[ri]
b.		[sudivizione] (multiple cycles, per the continuous-feeding model)

[19] This is assuming, contra Nespor and Vogel (1986), among others like Rubach and Booij (1990), that prefixes are not just stored with prosodic structure. This is considered here to be a highly improbable analysis, as the behaviour of prefixes shows cross-linguistic similarities that are inconsistent with the proposal that their behaviour is due to the lexical properties of individual morphemes.

c. 

[ri][sudivizione]

The above analysis, however, fails with examples like [dizuguale]. Here, given the syntax and semantics of the prefix, we expect it to have the same syntactic and phonological behaviour as *ri-*. The only way to obtain the correct output in the case of *disuguale* is to propose that the prefix is not an adjunct and is computed in the same cycle as the base. This, besides amounting to a description of the surface facts rather than an explanation for them, causes other insurmountable problems. First, recall the two meanings of *presentire* where [pre**z**entire] means 'to have a presentiment' (18c) while [pre**s**entire] means 'to hear in advance' (19b). These types of examples demonstrate that there are two ways in which a prefix can be combined with its base, and the semantically compositional meanings track the derivations in (26), where the prefix is phonologically separate from its base. As *dis-* is semantically compositional here, it is coherent to propose that its derivation tracks that of *ri-*. One could, of course, propose that *dis-* is not an adjunct and that its lack of idiomatic interpretation is accidental. This would also be coherent with a phase-based analysis of allosemy and idiomaticity (see Marantz 2013), as idiomaticity is possible, but not required, inside certain morphosyntactic domains. Even so, we must discount the proposal that *dis-* is merged directly to its base as all C-final prefixes behave the same way. Given the realizational nature of phase-based derivations, the phonological properties of the prefixes can have no impact on their syntactic behaviour. An analysis where C-final prefixes are all accidentally syntactically constrained to merge inside the first phase must be rejected.[20] This leads to the conclusion that the derivation of *disuguale* is syntactically similar in all relevant respects to (26), and that phonological readjustment is therefore a necessary operation to explain that di/s/ → di[z] intervocalically. There is no question; the prefix 'sees' the initial vowel of the base, and therefore the PIC does not apply absolutely in the phonology.

3.2 Cyclic PIC vs Post-cyclic exemption from the PIC

[20] See Zwicky and Pullum (1986) and subsequent work on phonology-free syntax.

That being the case, let us consider a system that relaxes the PIC somewhat. In Samuels (2009) we see a detailed discussion of the disconnect between the effects of syntactic phases and the requirements of the phonology coherent with the derivation we have just considered. Let us first briefly detail Samuel's account of cyclic phonology and its interaction with the PIC, and then will discuss how her framework incorporates post-cyclic effects.

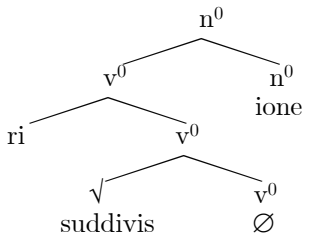
Samuels assumes Chomsky's PIC 2[21], and therefore sends the complement of the first phase head to PF upon merger of a second phase head. However, she proposes that if the structure sent to PF contains *only* the root that this will lead to a delay in the computation of the phonology proper. In an environment [v^0 [n^0 ROOT]] the merger of v^0 will trigger the transfer of the complement of n^0 to PF. As this transfer contains a single morpheme (the ROOT) phonological computation will not apply. Samuels argues that this is consistent with to Kenstowicz's (1994:208) Strict Cycle Condition and that this version of phasal spell-out derives the SCC.

(27) Strict Cycle Condition
A cyclic rule may apply to a string x just in case either of the following holds:
a. (SCC1) The rule makes crucial reference to information in the representation that spans the boundary between the current cycle and the preceding one.
b. (SCC2) The rule applies solely within the domain of the previous cycle but crucially refers to information supplied by a rule operating on the current cycle.

Given that a lone root morpheme in the phonology will not have access to a previous cycle it will not meet the requirements of either of the conditions of the SCC, and no phonological rules will apply. This effectively derives, in the phonology, Newell (2008)'s proposal that roots are unable to be sent to spell-out independently of other morphosyntactic structure. We will come back to this in the §3.4. With the above in mind, let us consider the derivation of *risuddivisione* in Samuel's framework (28 below, repeated from 26c).

[21] As well as Uriagereka (1999)'s cyclic spell-out of complex left branches. Samuels (2009:259:fn18) does not, however, agree that morphological adjuncts should spell-out individually, and that the proximity to the root is all that is required to derive the correct phonological facts appealed to in Newell (2008). We will abstract away from this here to facilitate the discussion of the Italian data within Samuel's framework. As the prefix is arguably closer to the root than the suffix in the examples discussed here, her framework would not allow for the suffix to interact with the root (via cyclic rules) across the prefix if the latter is merged cyclically within the same phase as the root.

(28)



In the above derivation we will assume that the prefix *ri-* is interpreted in an independent phase as we have been doing (but see fn.8). At the merger of v^0 and the root, no phasal transfer will be triggered, as the configurational requirements of PIC2 have not been met. When the prefix is adjoined, this extends the v^0 head's projection, but does not introduce a new phase head, and therefore no spell-out is triggered. It is upon merger of n^0 that the first transfer to PF occurs, of the complement of v^0.

(29) PF transfer 1: Vocabulary Insertion of the root only, phonology is delayed[22]
suddivis

The root alone will not undergo phonology. At the merger of a higher phase head, for example D^0, the complement of n^0 will then be transferred to PF. There, *suddivise* will undergo phonological computation, as it is not alone in its cycle.

(30) PF transfer 2: VI/linearization of the prefix-root-v^0, phonology applies
[ri] *suddivis* Ø[23]

[22] Note that even VI of the root will have to be delayed here in frameworks that allow for roots to undergo allomorphy.

[23] Here, we must make a slight detour and consider a technical complication that arises. If one assumes that syllabification is a cyclic rule, then it is unclear how it would apply in this cycle according to Samuel's vision of the interaction of phases and the SCC. The adjunct, being in a separate domain (and being V-final), has no phonological impact on the root. The v^0, being null, also has no phonological impact on the root. Given that no phonological rules impacting the root are triggered by either of the affixes inserted in this second cycle, by the SCC no phonological rules will apply to it. To be fair, Samuels states explicitly that the presence of a null head is adequate to trigger syllabification and cyclic stress rules on the root, but the technical details of how this works are not clear. If we consider Kalin (2022)'s work, it is clearly demonstrated that linearization must occur before VI. This being the case, VI and linearization occur before the phonology is triggered. If no exponent is inserted, the phonology-proper cannot apply a rule that is triggered by the presence of the null morpheme (SCC1) and therefore no other cyclic rules can apply within the root's cyclic domain (SCC2). We know from cross-linguistic data that the root-v^0 domain does undergo phonological computation, even when the v^0 is null. This is how the distinction between Marvin (2002)'s bi-cyclic twinkling with a syllabic [l]: [[twɪŋkl̩ Ø $_{v0}$]ɪŋ $_{n0}$], and her mono-cyclic twinkling with the [l] syllabifying in the onset of -ing [[twɪŋklɪŋ $_{n0}$] is derived. If the /l/ is followed by a vowel in its initial phonological cycle it can syllabify as an onset. If it is not it must syllabify in the nucleus, and this syllabification in the nucleus cannot be undone in the second cycle.

Assuming Samuel's vision of the Phonological PIC (see also and Marvin (2002)), when the root in *risuddivisione* undergoes spell-out with the null v^0 in the complement of n^0, it will no longer be accessible when the n^0 suffix *-ione* is transferred in the complement of the DP phase; only the edge of the previous phase, v^0, should be accessible. The s-voicing facts, however, necessitate that the root and suffix be visible to one another in the phonology.

One might ask if s-voicing could be considered to be a post-cyclic rule in Italian and if this would allow the derivation to output the correct form. Samuels proposes, in agreement with work like Marvin (2002), Pak (2008), and with work in the tradition of Lexical Morphology and Phonology, that certain, post-cyclic, phonological rules do not apply at every instance of spell out. In Samuel's framework, these post-cyclic rules are triggered by functional phase heads, for example D^0, C^0, or $v(oice)^0$. This includes rules like phrasal stress and intonation, or segmental processes that cross word boundaries, like flapping in English or liaison in French. As was shown in (18) and (19), however, s-voicing is a cyclic rule that applies only within certain domains within words. It does not occur in external sandhi. Additionally, in derivations like *ri[s]uddivi[z]ione* both instances of [s] are intervocalic within the complement of DP; their distinct behaviours give positive evidence that the rule is not applied across-the-board in this domain.

To conclude, even a framework within which the PIC applies to only a subset of phonological processes (cyclic) encounters problems with the Italian data. We will see in below that there are alternative analyses that would allow for voicing of the final /s/ of the root, but it will not allow for Samuel's account to generalize to the distinction between the V-final and C-final prefixes. No account wherein the PIC bans the reapplication of cyclic rules as a class can capture the Italian s-voicing pattern.

3.3 Modular PIC

Let us turn then to a framework that proposes that phases themselves may have variable behaviour with regards to the PIC within a language.[24] Before looking directly at this parametrization, it is of note that some proposals (e.g. Samuels 2009; Bošković 2005, 2012; Newell and Scheer 2021) argue that distinctions in the syntactic structure of a language itself will lead to cross-linguistic distinctions in the size of phonological cycles. For example, as pointed out in Samuels (2009:299) if work like that in Bošković (2005, et seq.) is on the right track, languages such as Serbo-Croatian and Chichewa do not project DP, and therefore the syntax will trigger no DP cycle. Any account of phase-based cycles may incorporate syntactically motivated variation to explain relevant cross-linguistic (or language-internal) distinctions in domain size. This type of variation is not treated in the Modular PIC framework. The distinction the Modular PIC makes harkens back, rather, to the initial proposals regarding the varying identity of phases. Chomsky (2001) proposes

[24] See also Marušič (2005) and subsequent work on the notion of non-simultaneous phases.

a distinction between *weak* and *strong* phases, where the latter, but not the former, trigger movement to their edge and spell-out of their complement. The proposed distinctions between weak and strong vPs have been successfully challenged and modified by works such as Legate (2003) and Richards (2011). The proposal in d'Alessandro and Scheer (2015) does not appeal to syntactic distinctions per se, but rather to distinctions in the lexicalised features that a phase head may carry that pertain to the interface. Specifically, they propose that each phase head may vary parametrically with regards to transfer to PF and LF; a phase head may transfer its complement to PF-only, LF-only, both PF and LF, or neither. Transfer leads to the application of the PIC. This results in a system where phases may have distinct behaviours within a single grammar.

To see how this framework can be applied, consider d'Alessandro and Scheer's account of another phenomenon that leads to various patterns in dialects of Italian, raddoppiamento fonosintattico (RF), a process of consonant gemination. RF applies between certain words, often when the first ends in a stressed syllable, but in some dialects only after certain lexically-specified morphemes, as is the case in the dialect of Abruzzese, below. The basic pattern can be demonstrated by considering (31).

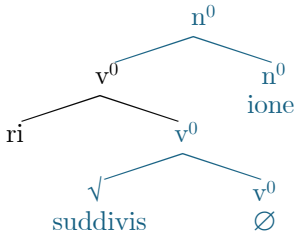
(31) a. so vistə
am seen
'I have seen'

b. so vvistə
am seen
'I am seen'

In the active (perfect) clause in (31a) RF is not triggered between the auxiliary and the main verb; even though the auxiliary here is an RF trigger in Abruzzese. In the passive clause in (31b), however, RF is triggered between the same auxiliary and the same main verb. The Modular PIC account proposes to capture this pattern by imbuing the active vP phase with a PIC at PF, while the passive vP has no transfer feature. As the passive vP has no phonological PIC, the auxiliary and the verb are visible to each other in the same phonological cycle, allowing RF to occur.

Now, let us apply this framework to the s-voicing data. Let us repeat again the structure from (26c/28).

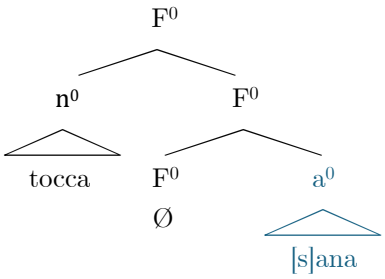
(32)



Here, what d'Alessandro and Scheer's framework might profitably propose is that neither the v^0 nor the n^0 phases trigger transfer to PF. The root phonology will therefore be accessible to any affixes in the derivation. This allows for the voicing of the final /s/ in *suddivis*, as it is processed in the same cycle as the nominal suffix (say, DP). The fact that there is no voicing of the initial /s/ must then be due to a PIC on the domain of the prefix itself. Let us assume here that adjuncts are all assigned a PIC, explaining the cross-linguistic tendency for prefixes to be phonologically independent.[25]

The data in (19c,d), in which clitics do not undergo or trigger s-voicing, could then be explained by assuming that clitics are also DPs (controversial), or that the verbs that clitics attach to are spelled-out in a strong vP phase (e.g. a voiceP). To account for the absence of s-voicing between compounds as in (19a) we might propose that a functional head F^0 that links the members of compounds (as in e.g., Di Sciullo (2005) or (Solhaug 2024)) which induces separate spell-out of each member of the compound, given that neither member of a compound constitutes a full DP.

(33)

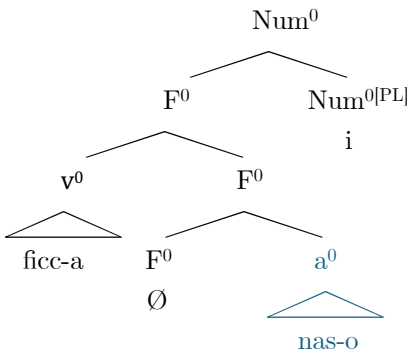


'cure-all'

Accounting for s-voicing between the second member of a compound and the plural marker, which takes the entire compound in its scope (e.g. *ficcana[z]i*, in (18b)) is unproblematic if, like in the structure in (33), thematic vowels that expone category and gender features are inside the structure of each compound member.

[25] Note that this assumption goes against the spirit of the Modular PIC, where variation in the PIC is a lexical property of phase-heads in individual languages, and therefore should not demonstrate cross-linguistic patterns unless they are derived outside of the Modular PIC system.

(33)



'busybodies'

In (33) the voicing of the /s/ in /nas/ occurs when it is spelled out in the complement of F^0, where it is intervocalic. The later addition of the plural suffix will then trigger hiatus resolution between the [o] and the plural /i/.[26] This resolution may appear problematic for the Modular PIC framework, as one might expect the PIC to block any phonological interaction between the a^0 domain and morphemes merged in subsequent phases. We cannot appeal to hiatus resolution being post-cyclic, as hiatus in external sandhi is permitted within a phrase (e.g. *gli animali* 'the animals'). Recall however, that the Modular PIC has a way to evade this apparent problem. D'Alessandro and Scheer, in a footnote, propose that the PIC must be relativized not only for its domain of application, but also for each individual phonological process.

> "...in addition to being module- and phase-head-specific, the PIC is process-specific. This is a well-known (but often unmentioned) fact about sandhi phonology. In (relevant varieties of) English, for example, t-flapping is unbounded by morphosyntactic divisions, but other phenomena such as word stress assignment apply only within words. Hence, the visibility of the word boundary is process-specific. This is more generally true for all boundaries and all processes in all languages: typically, a given morphosyntactic division blocks some phonological processes (word stress assignment in our example), while being permeable to others (t-flapping)."
>
> (D'Alessandro and Scheer 2015:600,fn5)

Although parametrizing the PIC to specific phonological processes renders the framework technically capable of capturing this kind of variation, allowing s-voicing and hiatus resolution in Italian to have separate domains of application, this additional source of intra-linguistic variability all but voids the possibility of the phase-based account of phonological domains having any predictive power. Note that d'Alessandro and Scheer are clearly correct in pointing out that the domains of application of distinct phonological

[26] Or, as in Krämer (2003), following Scalise (1983, 1984), the theme vowel is underspecified and merges with features of the plural affix. This type of analysis will allow for the correct predictions with regard to s-voicing in Samuel's PDbP account in the case of root-final /s/, as it will be intervocalic inside the first phonological cycle. As stated above, however, this will not allow for the incorporation of the prefix-final /s/ into the domain of the root in the PDbP system.

operations are (or at least appear to be) variable. This variability is exactly the type of pattern that is appealed to when proposing that phonological and morphosyntactic domains are non-isomorphic in Prosodic Phonology frameworks.

(34) a. morphosyntax: [[ficca $_{v0}$] [naso $_{n0}$] i $_{NumP}$]
b. phonology: [[ficca $_{PW}$] [naso-i $_{PW}$] $_{PW}$]

Nespor and Vogel (1986), as discussed in §2.5, propose that the morphosyntactic structure in (34a) is readjusted in the phonology to that in (34b). After this readjustment, both s-voicing and hiatus resolution can occur in the same domain, the Prosodic Word. This readjustment solution is not available to the Modular PIC framework, as it presumes a non-PH, flat, phonological framework. Instead, they would have to propose that s-voicing occurs in the domain of an F^0 which encompasses the compound but excludes the NumP and outer structure, or rather that F^0 is imbued with a PIC feature that applies to s-voicing. The domain of hiatus resolution would be triggered at a later phase (say DP) imbued with a relevant PIC.

Returning to the discussion of s-voicing, it is crucial here to note that neither the proposal that the PIC be parametrized for each phase in a language, nor the proposal that its parametrisation is sensitive to individual phonological processes, can explain the pattern of s-voicing that we see between prefixes and their bases in Italian. Recall that we were required to propose that the prefix *ri-* emerges in a separate, PIC-endowed, phase in order to explain its lack of effect on the initial /s/ in (32); *ri/s/udivi/z/ione*. Recall also that the /s/ in a C-final prefix such as *dis-* does undergo s-voicing when affixed to a V-initial base, as in *di/z/uguale*. As with Samuels' proposal, the Modular PIC account does not derive this kind of distinction. Both predict explicitly that a single phonological process in a particular phasal environment should behave in a uniform manner. Any phonological framework that appeals to the PIC encounters a fatal problem when the presence of a domain is visible in only certain phonologically-defined environments. Let us turn then to a discussion of a framework that allows for this variability withing a phase-based framework without proposing that the PIC exists at all. It is therefore neither sensitive to groups of rules (Samuels) nor to particular syntactic heads (d'Alessandro and Scheer).

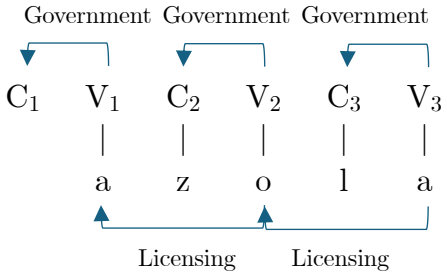
3.4 Phases, No Prosodic Hierarchy, no PIC

In Newell (2017b) an alternative to the Prosodic Phonology account of Italian prefixes was presented. It, like Nespor and Vogel's account, proposes that the lexicalized structure of the distinct prefixes determines their surface phonological behaviour. It does not, however, include any reference to the Prosodic Hierarchy. Rather, it is couched within the framework of CVCV phonology (Lowenstamm 1996, Scheer 2004), an offshoot of Government Phonology (Kaye et al. 1985). It promotes the view that the underlying

phonological form of a morpheme will be stored as underspecified when its alternation pattern warrants. This is a common proposal in frameworks that take autosegmental phonological structure seriously (e.g. McCarthy 1988, Kula 2008, Faust, Lampitelli and Ulfsbjorninn 2018, Bucci 2018, Newell 2021, Trommer 2021, Zimmermann 2021, among many others). Although frameworks that presume the Prosodic Hierarchy are also subsumed in the Autosegmental framework, it is important to recall that the Prosodic Hierarchy can be divided into two sections. Newell (2007, 2019 and other work) works within a framework that proposes that the Interface Levels of the PH do not qualify as phonological objects (following arguments in Scheer 2008, which also underpin arguments in Samuels 2009). It is proposed therefore that all apparent phonological domain effects of the PH are due to the workings of cyclic spell-out and the lower Phonological Levels in (16). We will see below that this type of framework allows for a coherent analysis of Italian s-voicing within a phase-based framework.

To grasp the specifics of the analysis to follow, let us first consider a few important details of the theory of autosegmental and 'syllabic' structure in CVCV Phonology. In CVCV Phonology the classic Onset-Rhyme syllable is instead proposed to be a simple alternating sequence of Cs and Vs on the timing tier.[27] C and V positions may be filled (linked to a melodic segment) or empty. When a position is empty it is available to host a segment if required by a phonological operation, or may remain empty, as can be seen in the initial onset position in (36).

(36)



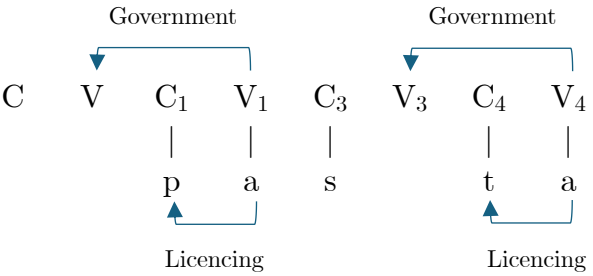
'buttonhole'

The proposal that empty slots may be found in syllabic structure is not proper to CVCV phonology. Every autosegmental theory of segmental organization presumes available empty positions (e.g. onsets in classic syllable theory, moras in moraic theory). What is specific to both empty and full positions in CVCV is that they may be targeted by one of two relationships, Licensing or Government. Note that these two relationships replace, but are equivalent in type to, the organizational nodes in classic syllable structure that the reader is surely familiar with (onset, rhyme, coda). Note also that, like in syllabic or moraic theories, the relationships relevant to the organization of segments are centred on

[27] A core tenet of this theory is that syllable structure is computed over linear relations, rather than being computed over both linear (sonority) and hierarchical relations as classic syllable structure is. At its base it is a non-hierarchical theory, which implies that the higher levels of the PH cannot be extensions of lower hierarchical structure.

nuclei. In (36) we can see that each pronounced vowel governs the consonant to its left and licenses the vowel to its left. The initial vowel governs the C that precedes it even though it has no V to its left to license. If we consider (37), we see that these relationships change when the representation contains empty nuclear positions. An empty V in CVCV must be governed by a following overt V, and an overt V that governs the empty V to its left will then enter into a licensing relationship with the C to its left. Note also that C-initial words will surface with an empty initial CV to their left, as discussed in §1. Further motivation for this empty CV can be found in Scheer (2004 and subsequent works).

(37) b.

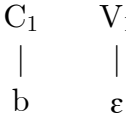


'pasta'

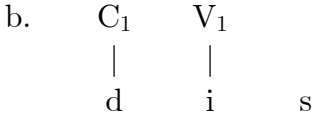
What is important for our discussion of s-voicing is the effect that government or licensing has on the consonants it targets. A consonant may emerge in a strong position (licensed, as are the [p] and [t] in *pasta*), or in one of two weak positions (ungoverned and unlicensed, as the [s] in *pasta*, or governed, as are all of the Cs in *azola*). Governed consonants in particular commonly undergo lenition via voicing.[28] The underlying /s/ in /asola/ becomes voiced intervocalically due to the fact that it is governed; there is a rule in the grammar of Italian such that /s/ → [z] when governed. Licenced positions are strong, and resist lenition (in Italian and cross-linguistically). In subsequent representations all arrows on top of the timing tier indicate government, and those below the melodic tier indicate licencing.

An empty vocalic position that has particular properties in the CVCV framework is the Final Nucleus. A Final Empty Nucleus (FEN) cannot (logiacally) be governed by a following pronounced vowel. Languages parametrically differ on whether they permit FENs. A language that does not allow consonant-final words, like Italian, does not permit Final Empty Nuclei to surface (we ignore loan words here). Morphemes that end in consonants may therefore have one of the two underlying structures (38). Remember that the CV-tier in CVCV Phonology will always Begin with a C and end with a V position.

(38) a.



b.

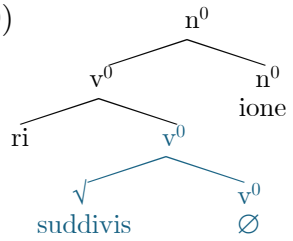


[28] See Szigetvári (2008) for a discussion of how the effects of lenition differ in codas and intervocalic positions.

A structure as in (38a) would require, in a language like Italian that does not allow FENs, that the FEN be filled. This type of structure is rampant in Italian, where roots are followed by final theme vowels that indicate gender and/or number (e.g. *bello, bella*). In structures like that in (38b), however, the final consonant is floating; it does not come with lexicalized syllabic space and therefore the structure does not contain a FEN that needs to be repaired. This kind of structure is classically discussed in another Romance language, French, where final liaison consonants are only pronounced if they can be linked to an empty onset in the following morpheme/word (*peti[ǂ] garçon* 'little boy' vs. *peti[t] ami* 'little friend/boyfriend'). Newell (2017b) argues that the structure in (38b) is the structure of consonant-final prefixes in Italian (See van Oostendorp 1999 for a similar analysis which employs traditional syllable structure and the PH). One important distinction between French and Italian here is that the floating *s* in (38b) may link to any empty C position, regardless of whether the following V is filled on the segmental/melodic tier (before a vowel, as in *di[z]uguale* 'unequal') or not (before a consonant, as in *di[s]gelo* 'thaw/unfreeze'). Only in the former will the /s/ be targeted by government, as will be seen below.

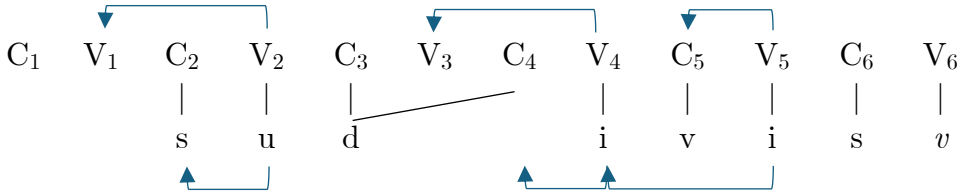
We now have the background to understand how Newell's account of the distinction in environments for s-voicing functions. The relevant structure is repeated below.

(39)



The first phase (v^0) emerges as in (40), below. Remember that C-initial domains emerge with an initial empty CV.

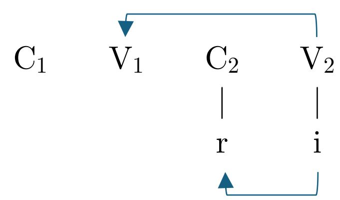
(40)



We assume here, following Krämer 2003 that the V_6 contains a segment that is only partially specified (indicated by *v*), as FENs are not permitted.

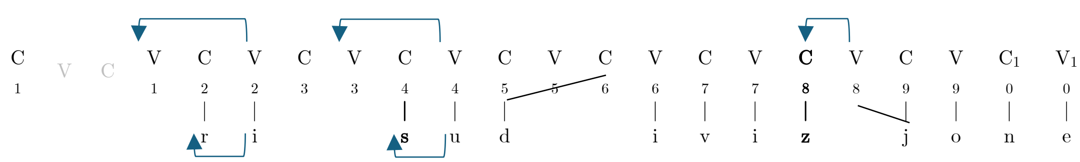
As in the previous derivations, the prefix will spell-out concurrently in its own phase.

(41)



In the third phase the outer suffix is computed, and all three overt morphemes are linearized. Newell (2017b) proposes that the initial vowels of Italian suffixes are also floating.[29] This allows for them to either link to or coalesce with the preceding vocalic position, or to link to a VC sequence if they are followed by a vowel, surfacing as a glide as in (42). There is no empty CV inserted immediately preceding the suffix, as the left edge of the third phase in (42) precedes the prefix. Newell argues in all of her work that a Continuous-feeding model of spell-out is necessary, rather than the more commonly-assumed Holding-bin model. Note that when an empty VC-sequence emerges in a structure, often due to the insertion of a sequence of left-edge CVs, it will be deleted if it remains empty (indicated in grey in (42)) (Gussmann and Kaye 1993)).

(42)



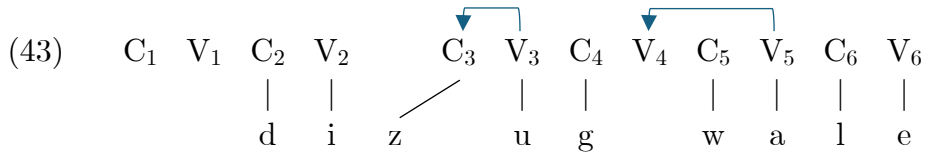
In (42) only the relevant Government and Licencing relations are marked so as not to clutter the representation unnecessarily. Note that the leftmost V in the suffix, V_8, Governs C_8, causing s-voicing. The *s* at the beginning of the root in C_4 finds itself in a different relationship to the segments surrounding it. As it is preceded by a phase-initial empty CV, the vowel in V_4 must govern V_3. V_4 therefore Licences C_4. A licenced position resists lenition. The *s* in C_4 therefore does not undergo voicing, even though it is flanked by vowels on the melodic tier.

Turning to the case of consonant-final prefixes, the final floating consonant (recall the structure of the prefix in (38b)) links to the empty initial C position of the phase that contains the root, as in (43). This analysis has in common with van Oostendorp (1999) and Peperkamp (1994) that a syllabification algorithm motivates the prefix-final s-voicing, but is distinct in that it does not appeal to the interface domains of Prosodic Phonology. Krämer (2009) also argues that the PW is unnecessary in the analysis of the Italian s-voicing pattern. His analysis appeal to the notion ‘stem’, however. The stem is rejected in Newell’s analysis as it adds unnecessary structural complexity (just as an appeal to the PW does), as well as rendering the analysis non-modular (‘stem’ is not a phonological

[29] This analysis is not specific to Italian. See Newell (2021a) for an analysis wherein English ‘Level 1’ affixes also have initial floating vowels.

entity, and therefore should not enter into phonological computation). This same criticism via modularity can be leveled at van Oostendorp's analysis, as it contains OT constraints that appeal simultaneously to syllable structure and to morpheme boundaries (following Vogel 1983).

(43)



Upon linearization of the prefix and the root phases, the floating *s* links to the empty C_3 position. It is therefore intervocalic, governed, and lenites. No appeal to the PH, the stem, or to non-isomorphism is required. Non-isomorphism cannot emerge in systems where the phonology is flat, as no constituency relations are formed in the phonology.[30]

Note that Newell's work argues specifically against the existence of the PIC (Newell 2017a, 2021a,b; Newell and Piggott 2014) and therefore the floating C is not prevented in any way from linking to the empty C position within the output structure of the previous phase. If we compare the derivation in (43) to the derivation in (42), wherein the root-initial [s] does not undergo voicing, we can see that this is not an effect of the PIC, but rather of the fact that the root-initial [s] in (42) is licensed, while the prefix-final [z] in (43) is governed. The phonological structures that emerge via cyclic spell-out at the syllabic/CVCV level are all that is required to capture the pattern. The effect of cyclic spell-out is reduced to the insertion of the empty CV at the left edge of spell-out domains. The final structure appeals to neither phasal PICs nor to the interface domains of the PH, but only to output phonological structures required independently in every framework, those of the lower Phonological Levels in (16).

3.5 Comparing the above analyses

Let us now ask what the above comparisons allow us to conclude regarding the different phase-based phonological frameworks.

The analyses above are clearly parallel each other in some ways and differ in others. Both Samuels' Phonological Derivation by Phase (PDbP) and d'Alessandro and Scheer's Modular PIC encounter problems in accounting for the variable behaviour of the prefixes in Italian. This is due to the postulate in these frameworks that phasal spell-out implies the action of the Phase Impenetrability Condition (PIC) as a constraint over derivations. On the other hand, the accounts in Nespor and Vogel (1986) and Newell (2017a) allow for

[30] See Newell (2019) for a discussion of how the PH, and the concomitant proposal that the phonology contains hierarchical structure, brought about the 'problem' of Bracketing Paradoxes, which do not logically exist in linear phonological frameworks.

modification of previously spelled-out phases in ways that appeal directly to the phonological structure itself. These latter accounts agree that the difference between the V-final and C-final prefixes in Italian must be stored in the lexicon. In Nespor and Vogel's account this distinction is due to the vowel-final prefixes being lexicalized with prosodic structure (PW), while the consonant-final prefixes are not. In Newell's account, the consonant-final prefixes contain a final floating segment, while the segments of vowel-final prefixes are fully syllabified underlyingly. Both accounts capture the intuition that the consonant-final prefixes are dependent on the base to their right, while the vowel-final prefixes are not. Both accounts also agree that the suffixes in Italian are dependent on their bases.

These accounts differ, however, in important ways. Nespor and Vogel's account requires that the phonological module project and manipulate the Interface Levels of the Prosodic Hierarchy. It also requires that what is lexicalized is the status of the V-final prefixes as non-alternating. Newell's account does away with these Interface Levels, relying purely on the lower Phonological Levels in (16). This is an important distinction, as Newell's account contains a subset of the tools required in Nespor and Vogel's system.[31] Even though Nespor and Vogel do not appeal to floating segments in their account of s-voicing in Italian, every phonological framework must have a way to capture the distinction between a stable segment (e.g., the final C in *neuf* 'nine' in French: *neu[f] balles* 'nine balls', *neu[f] amis* 'nine friends', or the alternating Yer vowels in Slavic languages) versus an unstable, liaison, segment (e.g. the final C in *petit* 'little' in French *peti[#] garçon* 'little boy', *peti[t] ami* 'little friend/boyfriend', or non-alternating vowels). Newell's appeal to floating segments is therefore an appeal to a tool in the toolbox of every phonological framework and explains the behaviour of both suffixes and prefixes that undergo Phonological Merger with a single structural tool.

There is also an important distinction in what types of structures are lexicalized in the two accounts. Recall that Nespor and Vogel's account predates phasal spell-out. The only domain-based mechanism available to them for explaining unexpected non-applications of phonological processes was the lexicalization of prosodic structure. One might consider this type of lexicalization, however, to be at odds with the division between the 'phonological' and 'interface' levels of the Prosodic Hierarchy. The interface levels were proposed to be those that were derived via a translation of *syntactic* structure. Proposing the lexicalization of the interface levels of the PH doubles the sources of such structure, and subsequently weakens the explanatory capacities of the framework. In Newell's account, it is the behaviour of V-final prefixes that is 'normal'. Their behaviour is predicted without extra machinery by the phasal spell-out algorithm. It is therefore the

[31] Of course, any advantage Newell's account may have in this regard is lost if it is shown that the PH is necessary to account for other phenomena. One might immediately conclude that the PH is a necessary tool, given the enormous amount of literature that presumes this to be the case. However, I believe we are entering a phase of phonological theorizing that, given the increasingly fine-grained syntactic analyses on offer, has the tools to seriously question the necessity of the PH.

behaviour of C-final affixes that must be lexicalized. This lexicalization is accomplished via the *underspecification* of the purely phonological structure. Underspecification is a tool proposed to explain many other phonological processes that are not necessarily related to the discussion of the syntax-phonology interface (e.g. vowel harmony, non-derived environment effects, archiphonemes, tonal/subsegmental morphemes) and therefore is independently necessary in any autosegmental framework.

The reader might be wondering why this section is concluding with a discussion of the lexicalization of underlying structures. The reason for this is that, if the PIC is not operative in the phonology, then its effects have to be accounted for otherwise. The take-home message of §3 is therefore that phases may account very well for the determination of phonological domains, but they do not do so well in accounting for patterns of phonological transparency. This is, however, not a fault in the phase-based framework. Phonological computation is a complex interaction between the determination of phonological domains and the workings of the 'phonology-proper', which begins with the underlying representations of morphemes.

4. Phonology and Phases: Conclusions and Extensions

In this concluding section I would first like to recap the main messages that I hope the reader will take away from the preceding discussions. In §1 we saw that many syntacticians are in agreement that phases are the most promising theory of cyclic syntactic domains to date. The syntactic literature, however, has yet to come to a consensus on numerous aspects of the theory. There are disagreements with regards to the timing of spell-out, to the size of the spell-out domain, and to whether and when previously spelled-out domains are accessible to further operations. Yet, these disagreements do not lead to vastly different theories of the interface. They are nuanced and may depend on a number of independently active parameters in grammars in general or in the grammars of particular languages. It is therefore required of linguists working at the syntax-phonology interface to be aware of and sensitive to the various arguments in the syntactic literature that pertain to phases in general, as well as to both the analyses of the (non-interface and interface) syntax of and phonology of the languages they study. A phonologist cannot assume that any verbal construction will have the properties of a phasal vP, that any nominal construction will have the behaviour of a phasal DP, or that any clausal construction will have the behaviour of a phasal CP. Working from the other direction, it is also necessary for a linguist working at the syntax-PF interface to consider how distinct phonological frameworks impact the analysis. Instead of presuming uncritically that the PIC is operative in the phonology, one must also consider the proposition that no phonological operations are banned from operating across a phase boundary. That said, it is clearly the case that phonological rules do apply selectively in different domains of cyclic derivations. We have seen in the discussion above many purely phonological solutions to this type of pattern. OT analyses propose the promotion of Faithfulness constraints between one cycle and the next, or to

a universal ranking of Left-Edge Alignment over Right-Edge Alignment to capture effects similar to (but distinct from) those induced by the initial empty CV in §3. Prosodic Phonology can propose similar modifications to the phonological grammar by marking each rule with a diacritic that determines the structural domain within which it will apply (e.g., within the PW). These two strategies are also appealed to in Co-Phonology frameworks. CVCV phonology proposes that cross-linguistic patterns that distinguish the left from the right edge of phasal domains is due to a difference in syllabic structure: there may be an extra empty syllable only at the left edge of domains. We also saw that the Elsewhere Principle can be applied to a detailed description of specific phonological environments in a way that allows for the construction of phonological structure (e.g., syllables) to bleed the application of general phonological rules. All of these proposals have in common that they are trying to account for the fact that phonological structure that is built in a cycle X is resistant to modification in a cycle X+n. But none of them appeal to a broad strokes ban on the modification of previously computed phonological structure. Any phonological theory that attempts to adhere to such a ban will be, I claim in this chapter, immediately proven wrong. The data tell us that any work at the PF interface must reject the PIC.

But work at the syntax-PF interface also has a particular role to play in the settling of the other disagreements laid out in §1. Consider what occurs if a phonologist assumes that the PIC2 holds (or, rejecting the PIC, assumes that cycle X is triggered at the merger of phase head X+1), and that the complements of phase heads undergo spell out. Although this is the majority opinion in the syntactic literature, much of the phonological literature appears to disagree. Take the almost universal consensus that roots are spelled out with at least one other morpheme. If roots are the complement of a category-defining phase head, then we have two dichotomous quasi-consensus. On the one hand it is the complement domain that is presumed to spell out, and on the other, there is a certain complement domain that is seemingly a universal exception to the pattern. Therefore, phonologists might look at their task at the interface to look for similar nuanced patterns that can confirm or deny these small distinctions made within the different proposals for the mechanics of phasal spell-out.

In this chapter we did not have space to discuss larger phasal domains, those that correspond to what are known as Phonological Phrases. The questions and conclusions presented in this chapter are, however, equally relevant for larger domains. To take one example, Cheng and Downing (2016) make specific arguments that a phase-based framework cannot account for the prosodic phrasing found in various Bantu languages. Much of the argumentation in that article, however, rests on the assumption that phases imply a Holding-bin model of phasal spell out. If the data is examined through the lens of a Continuous-feeling model, the proposed mismatches between the domains predicted

by phasal computations and the phonological domains seen on the surface dissolve.[32] What the discussion in this chapter has hopefully highlighted is that we need to motivate the parameters we assume for our phasal framework when we work at the interface. In order to do so we need to consider the various possibilities in the literature outlined in §1. The decisions we make, both regarding the syntax and the phonology can have important implications for whether we see phases as explaining domain effects, or as being incompatible with them.

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