Acta Linguistica Academica 69 (2022) 1, 36–58
DOI: 10.1556/2062.2021.00438

AKADÉMIAI KIADÓ

The role of phonology in Vata adjectival agreement

SEBASTIAN BREDEMANN*

Goethe-Universität Frankfurt am Main, Germany

Received: November 7, 2020 • Accepted: July 13, 2021
Published online: November 30, 2021

ABSTRACT

In realizational theories of morphology, different opinions exist on the relationship between phonology and Vocabulary Insertion. On the one hand, there are separational theories like Distributed Morphology (Halle & Marantz 1993), which assume that Vocabulary Insertion does not interact with the phonological component of the grammar. These theories predict that the properties of a language's regular phonology never play a role when vocabulary items (VIs) are inserted. The opposite view is held by integrational theories as, for instance, proposed in Wolf (2008). These theories assume that the general phonology of a language can influence Vocabulary Insertion. Based on adjectival agreement in the language Vata, I propose an integrational model that assumes that Vocabulary Insertion applies in an Optimality-Theoretic (Prince & Smolensky 1993) phonology, where regular phonological constraints are active. I propose that the phonology consists of two levels: one level where VIs are inserted and one level for regular phonology.

KEYWORDS

phonology-morphology interface, Optimality Theory, Vocabulary Insertion, realizational morphology

1. INTRODUCTION

The question of how phonology influences morphological realization has been hotly debated since SPE (Chomsky & Halle 1968) and has gained considerable attention within Optimality Theory (Prince & Smolensky 1993). By modelling phonological alternations by surface constraints on phonological structure, the question arises how such constraints play a role in morphology, since the combination of morphemes creates phonological representations which violate or satisfy a

* Corresponding author. E-mail: bredemann@lingua.uni-frankfurt.de

constraint's demand on phonological surface structure. The theoretical discussion has been primarily concerned with phonologically conditioned allomorphy (see, for instance, Paster 2006).

In present-day research on morphology, it is mostly assumed that morphology is *realizational* instead of *incremental*, using Stump's (2001) terminology. Unlike incremental theories, realizational theories assume that (inflectional) morphemes do not introduce morphosyntactic features together with their exponents. Instead, morphosyntactic information is independently available, and morphology maps the abstract morphosyntactic representation to a phonological representation. The process that maps abstract morphosyntactic features to their exponence is called *Vocabulary Insertion*. The power of the phonological component in morphology thus depends on whether phonological constraints apply at Vocabulary Insertion or not. On the one hand, there are what I call *separational* theories, which assume that Vocabulary Insertion applies independently from phonology. The standard separational theories are rule-based, such as Distributed Morphology and Nanosyntax (Starke 2009). Separational OT-based theories include Distributed Optimality (Trommer 2001) and Optimality-Theoretic Distributed Morphology (Rolle 2020). In separational theories, the general phonology is not involved in Vocabulary Insertion. Phonological information may be referenced in separational models but not through grammatical statements that determine the general phonology (like phonological OT constraints). Instead, sensitivity to phonological information is attributed to the lexical entries of vocabulary items. The separation between the phonological component and Vocabulary Insertion follows from the grammatical architecture in which Vocabulary Insertion is assumed to precede phonology.

The opposite view is held by *integrational* theories. These, usually OT-based, theories assume that Vocabulary Insertion can be influenced by the general phonology of a language (Wolf 2008; Pertsova 2015; Smith 2015). The parallel character of these models allows the assumption that general phonological constraints stand in competition with constraints on morpheme realization.

Persuasive evidence for integrational models is presented by cases where the effect of phonological information goes so far that a morpheme is inserted that does not match the morphosyntactic input (Wolf 2008, chap. 2.4). Such a case is observed in the language Vata. This language features an agreement mismatch, where the stem vowel [ɔ] of an adjective forces the adjective to take an agreement marker that does not match the class of the head noun. Based on the agreement mismatch in Vata, I propose an integrational model that assumes Vocabulary Insertion to apply in the phonological component (Wolf 2008).

Section 2 shows the agreement classes for adjectives in Vata and illustrates an agreement mismatch for plural adjectives. In section 3, it is shown how a separational model fails to provide an insightful explanation for the agreement mismatch. Section 4 proposes an integrational, Optimality-Theoretic analysis that is capable of accounting for the agreement mismatch. Section 5 concludes.

2. ADJECTIVAL AGREEMENT IN VATA

In Vata, adjectives show DP-internal agreement with the head noun. When it comes to adjectival agreement, Vata nouns fall into two classes.[1] Class 1 contains all human nouns and a

[1] All empirical generalizations about Vata as well as the examples provided in this paper are the result of fieldwork conducted personally by the author. The fieldwork was conducted in 2019, when I interviewed 6 male native speakers. All examples that are not provided by personal fieldwork are indicated by references. The following abbreviations and symbols are used: AGR = agreement, N = noun, 3P = third person, POSS = possessive, √ = lexical root, VI = vocabulary item.

small set of nouns referring to animals. Class 2 contains all remaining nouns, including all animals that do not fall into Class 1. It seems to be semantically arbitrary which animals fall into which class. Since the number of animals that fall into Class 1 is rather small, I take Class 2 to be the default class.[2]

The number of adjectives that agree for class is quite small, as only 8 adjectives show class-agreement. Adjectival agreement is exclusively suffixing. Due to a general word-internal ATR-harmony process in Vata, the ATR-value of the agreement morphemes depends on the ATR-value of the adjectival stem. All adjectives illustrated in this paper are [−ATR]. The tones in all cases are provided by the roots. Tones will be marked throughout the examples. Vata features four tonal levels; the highest will be marked by the superscript [^{4}] and the lowest by [^{1}].

2.1. Class 1: human nouns and some animals

Nouns in this class trigger agreement markers to be realized as [ɔ] in the singular. An example for a human noun is given in (1a), and example (1b) shows an animal referent.

(1) a. *ɲɛɓɛlʊ*$^{2.2.1}$ *zal-***ɔ**$^{1.1}$
man.N.3P red-AGR:N.3P
'a red man'

b. *dɔljɔ*$^{4.1}$ *zal-***ɔ**$^{1.1}$
mouse.N.3P red-AGR:N.3P
'a red mouse'

Plural nouns in Class 1 trigger the agreement morpheme [wa][3] on adjectives. Examples are given in (2):

(2) a. *ɲɛɓɛl-ɪ*$^{2.2.1}$ *zal-***wa**$^{1.1}$
man.N.3P-PL red-AGR:N.3P.PL
'red men'

b. *dɔl-ja*$^{4.1}$ *zal-***wa**$^{1.1}$
mouse.N.3P-PL red-AGR:N.3P.PL
'red mice'

I follow Sande's (2018) analysis for a closely related Kru language Guébie and assume that nouns in this class are morphosyntactically characterized by a {3P} (third person) feature (Richards 2014) and a noun {N} feature. Adjectives agree with nouns in the features {PL.3P.N}.

As shown in the examples, plural nouns in Class 1 take different suffixes. Plural markers cannot be predicted by agreement classes but are determined by other factors. As shown in Kaye (1981, 233–235), nouns generally take the plural marker [ɪ/i] but there are exceptions. For instance, nouns ending on [jɔ], as *dɔljɔ* in (2b), take the marker [ja] ([jɔ] and [ja] are offglides, hence complex vowels). For other plural allomorphs and their distribution see Kaye (1981). These plural markers replace the final vowel in the singular form, which is part of the stem. Singular nouns in Class 1 mostly end on [ɔ]. Other final vowels are also allowed, as for instance

[2]When in doubt, the informants prefer Class 2 for an animal referent.

[3]An anonymous reviewer pointed out that [wa] might consist of two morphemes: the (class) agreement morpheme /ɔ/ plus a plural morpheme /a/, with /ɔ/ being glided in phonology. If /a/ expresses only plural agreement, it must be explained why it does not appear under Class 2 agreement. Furthermore, as shown in Kaye (1982), sequences of (non-high) vowels undergo total assimilation and not gliding.

ɲɛ̃mã ‘friend’ and loanwords like *pɛɾɪ̠* ‘priest’. There are no restrictions on the final vowels that singular forms may take in either Class 1 or Class 2.

2.2. Class 2: default

Parallelly to Sande’s (2018) analysis of Guébie, I assume the default class in Vata to be characterized by the absence of the {3P} feature. Nouns in this class are only specified for the feature {N}. In the singular, Class 2 nouns trigger one of the three different agreement markers [ɛ/e, a, ʊ/u]. In most cases, the phonology of the controller noun determines which of those three agreement markers is selected. This phenomenon will be referred to as phonological agreement.[4] An agreement morpheme is selected that agrees with the noun-final vowel for the features [back, low, round]: Nouns that end on the [−back, −low, −round] vowels [ɛ, e, i, ɪ] trigger the [−back, −low, −round] agreement morpheme [ɛ/e]. Nouns that end on the [+back, -low, +round] vowels [ʊ, u, ɔ, o] trigger the [+back, −low, +round] agreement morpheme [ʊ/u]. Nouns ending on the [+back, +low, −round] vowels [a, ʌ] trigger the agreement morpheme [a]. A summary of the phonological agreement facts is given in (3); examples are provided in (4).

(3) Phonological dependencies between noun-final vowel and agreement morpheme

Noun-final vowel		Agreement morpheme	
ɪ, i, ɛ, e	[–back, –low, –round]	**ɛ/e**	[–back, –low, –round, –high]
ʊ, u, ɔ, o	[+back, –low, +round]	**ʊ/u**	[+back, –low, +round, +high]
a, ʌ	[+back, +low, –round]	**a/ʌ**	[+back, +low, –round, –high]

(4) a. *nrɛ*[2] *zal-ɛ*[1.1]
animal.N red-AGR:N
‘a red animal’

b. *fulu*[3.1] *zal-**ʊ***[1.1]
rat.N red-AGR:N
‘a red rat’

c. *saka*[3.4] *zal-**a***[1.1]
rice.N red-AGR:N
‘red rice’

In terms of descriptive adequacy, phonological agreement could be analyzed as purely morphologically determined agreement. However, unanswered questions remain under such an analysis. One could, for instance, assume that the final vowels of Class 2 singular nouns are class markers and that the morphemes [ɛ/e, a/ʌ, ʊ/u] express agreement with these classes. Then, class 2 would consist of 5 sub-classes with three agreement morphemes for these classes, as illustrated in (5).

[4]Agreement that is determined by phonological, instead of syntactic or semantic features is also claimed to exist in Guébie (Sande 2018) and other Kru languages, as well as Bainuk (Sauvageot 1967) and Abu’ (Nekitel 1986).

(5) Class 2 singular agreement as morphological agreement

class	class marker	Agreement morpheme
1	ɪ/i	**ɛ/e**
2	ɛ/e	
3	ʊ/u	**ʊ/u**
4	ɔ/o	
5	a/ʌ	**a/ʌ**

However, such an analysis is problematic: Since phonologically agreeing nouns in Class 2 can end on any vowel the phonology of Vata allows, we would then assume that there are as many classes as (phonemic) vowels in Vata. We would also assume that it is an accident of the lexicon that the class marker and the agreement morpheme have identical values for [back], [low] and [round] in each class. A morphological analysis thus fails to account for the phonological predictability between the class of a noun and its phonological form. The assumption that Class 2 agreement is determined by phonological properties, on the other hand, explains the phonological predictability between the noun-final vowel and the agreement marker.

This paper will not provide a new analysis of phonological agreement in Vata. For a theoretical discussion of phonological agreement systems, see Sande (2017, 2018), where the phonological agreement system in the Kru language Guébie is discussed, which is identical to the one in Vata.

There is a small set of nouns in Vata that trigger the agreement morpheme [a] on adjectives although they do not end in a low vowel. This group of nouns is thus exempt from phonological agreement. An example is provided in (6).

(6) Singular nouns that do not trigger phonological agreement

lepkli$^{1.4}$ *zal-**a***$^{1.1}$
hat.N red-AGR:N
'a red hat'

All these nouns are inanimate and end in either [i/ɪ] or [e]. There are two ways to handle this group. One possibility is to assume that they form a separate morphological agreement class and that the morpheme [a] realizes agreement for that particular class feature. The other solution would be to assume that these nouns are lexically marked to be exempt from phonological agreement and therefore all trigger the agreement morpheme [a] as a default. I will not make a choice between these solutions, as the analysis argued for in this paper does not depend on it.

In the plural, all Class 2 nouns trigger the agreement morpheme [ɪ/i] on adjectives. Examples are given in (7).

(7) a. *nr-a*^{2} *zal-**ɪ***$^{1.1}$
animal.N-PL red-AGR:N.PL
'red animals'

b. *ful-i*$^{3.1}$ *zal-**ɪ***$^{1.1}$
rat.N-PL red-AGR:N.PL
'red rats'

2.3. Agreement mismatch under plural agreement

Adjectival agreement features an agreement mismatch that is triggered by the phonology of the adjective. Under agreement with plural nouns of Class 1, adjectives with the stem vowel [ɔ] take the Class 2 agreement morpheme [ɪ] instead of the expected Class 1 agreement marker [wa]. This is exemplified in (8).

(8)

a.	*ɲɛɓɛl-ɪ* $^{2.2.1}$	*pɔp-**ɪ*** $^{3.4}$	b.	*ɲɛɓɛl-ɪ* $^{2.2.1}$	*wɔt-**ɪ*** $^{2.1}$
	man.N.3P-PL	white-**AGR:N.PL**		man.N.3P-PL	cold-**AGR:N.PL**
	'white men'[5]			'cold men'	
c.	*dɔlj-a* $^{4.1}$	*pɔp-**ɪ*** $^{3.4}$	d.	*dɔlj-a* $^{4.1}$	*wɔt-**ɪ*** $^{2.1}$
	mouse.N.3P-PL	white-**AGR:N.PL**		mouse.N.3P-PL	cold-**AGR:N.PL**
	'white mice'			'cold mice'	

Forms with the stem vowel [ɔ] that take the Class 1 agreement morpheme like *[pɔp-wa] are ungrammatical in Vata. It is the phonology of the adjectival stem that overrules the agreement morphology: The morphosyntactic feature {3P} is not realized to avoid the phonological sequence [ɔ-w]. For some speakers, the adjective [k**ɔ**s-^{1}] 'hard' shows class agreement. This seems to be a recent development in the language, as class agreement for this adjective is absent in older speakers. When this adjective does show agreement for class, it features the agreement mismatch [k**ɔ**sɪ$^{1.1}$]. This shows that the agreement mismatch is productive.

Older informants apply a different strategy to avoid the ungrammatical forms like [p**ɔ**p-wa] or *[w**ɔ**t-wa]. Instead of inserting [ɪ], they insert the Class 1 singular agreement marker [ɔ], yielding the form [p**ɔ**p-ɔ], as shown in (9). The agreement mismatch in the case of the older informants thus concerns number instead of {3P}, as it is the {PL} feature that is not realized.

(9)

dɔlj-a $^{4.1}$	*pɔp-**ɔ*** $^{3.4}$
mouse.N.3P-<u>PL</u>	white-**AGR:N.3P**
'white mice'	

That the agreement mismatch has a phonological motivation is evident from the fact that the avoidance of [ɔ] and [w] is also observed in the general phonology of Vata. For instance, this combination is avoided within nominal stems. A related phonological process is observed in offglide formation, as shown in Kaye (1981).[6] All combinations of glides and vowels are licensed, but the offglide [wɔ] is avoided. Instead, if the context for offglide formation is derived, [w] is deleted when followed by the plural marker [ɔ]:

(10) (Kaye 1981, 82–83)

	UR	SR	meaning
a.	/lwɛ^{2}/	[lwɛ^{2}]	'elephant'
	/l**w**-<u>**ɔ**</u>^{2}/	[l**ɔ**^{2}]	'elephant-PL'
b.	/gwɛ^{4}/	[gwɛ^{4}]	'ape'
	/g**w**-<u>ɔ</u>^{4}/	[g**ɔ**^{4}]	'ape-PL'

[5]The meaning of the adjective [pɔp] is 'white' in the literal sense only, like being dressed completely white, for instance. Neither is an interpretation in terms of ethnicity intended for this example, nor is it possible in Vata.

[6]In Kaye (1981) offglides are referred to as diphthongs.

The agreement mismatch is the core argument of the analysis presented in section 4. In the following section I will discuss analyses and lay out a model of morphology and phonology that is able to account for the agreement mismatch.

3. CONSIDERING POSSIBLE ANALYSES

To account for the agreement mismatch, two types of analyses are available. The most straightforward attempt to explain the agreement mismatch is to assume that actual agreement for syntactic features is different for adjectives with the stem vowel [ɔ].

Under such an analysis, the syntax somehow rules out the possibility that the agreement morpheme [wa] with the features {N.3P.PL} may be merged to adjectives with the stem vowel [ɔ]. The application of agreement is thus sensitive to phonological information and agreement for {3P} does not apply to adjectives with the stem vowel [ɔ]. Instead, the agreement morpheme [ɪ/i] is merged to the adjectives, although it lacks the feature {3P}, creating a mismatch between the noun and the agreeing adjectives in terms of morphosyntactic features.

The assumption that the adjectival stem vowel can determine syntactic agreement goes against the assumption within most generative frameworks of syntax that phonological information cannot influence syntactic computation in any way. This claim was formalized by Zwicky and Pullum (1986) in *The Principle of Phonology-Free Syntax*.

(11) The Principle of Phonology-Free Syntax (PPFS)
No syntactic rule can be subject to language-particular phonological conditions or constraints. (Zwicky & Pullum 1986, 61)

This claim has faced challenges in the literature (see for instance Bennett et al. 2016). Apparent counterexamples to the PPFS, however, concern prosodic structure. To my knowledge, there has not been evidence provided for cases where segmental information like the vowel [ɔ] influences syntactic computation. The assumption that segmental information in Vata does determine syntactic computation should thus only be employed if no other adequate analysis is available. Since a morphophonological analysis, which is discussed in the next section, can account for the agreement mismatch without breaking with the PPFS, a syntactic analysis should be rejected.

3.1. A morphophonological account

The second type of analysis is a morphophonological one. Such an analysis assumes a realizational morphological component, where the agreement mismatch is created at Vocabulary Insertion.

The basic assumptions of a morphophonological analysis are illustrated in (12): Since the morphology is realizational, the syntactic representation contains no phonological information. Agreement applies regularly between nouns and adjectives within the DP, independently from phonological information. Class 1 nouns trigger agreement for {N.3P.PL} and Class 2 nouns trigger agreement for {N.PL} on adjectives. Therefore, even adjectives with the stem vowel [ɔ] feature regular Class 1 agreement at the level of syntax. The agreement mismatch is created at Vocabulary Insertion when the agreement features on the adjectives are provided with exponents: Class 2 agreement, as in (12a), is always realized by the exponent [ɪ/i]. Regular Class 1 agreement is realized by [wa], as in (12c). When the adjective has the stem vowel [ɔ], however, as in (12b), the exponent [ɪ/i] realizes Class 1 agreement as well.

(12)		Agreement in the syntax			Vocabulary Insertion		
	a.	{√rat.N-PL	√red-AGR:N.PL}DP	→	ful-i	zal-	ɪ/i
	b.	{√man.N.3P-PL	√white-AGR:N.3P.PL}DP	→	ɲɛɓɛl-ɪ	pɔp-	
	c.	{√man.N.3P-PL	√red-AGR:N.3P.PL}DP	→	ɲɛɓɛl-ɪ	zal-	wa

In the case of the older informants, the same dual function is shown by the morpheme [ɔ], which realizes all singular agreement in Class 1 but also plural agreement in the case of adjectives with the vowel [ɔ].

(13)		Agreement in the syntax			Vocabulary Insertion		
	a.	{√man.N.3P √red-AGR:N.3P}DP		→	ɲɛɓɛlʊ	zal-	ɔ
	b.	{√man.N.3P-PL	√white-AGR:N.3P.PL}DP	→	ɲɛɓɛl-ɪ	pɔp-	
	c.	{√man.N.3P-PL	√red-AGR:N.3P.PL}DP	→	ɲɛɓɛl-ɪ	zal-	wa

Whether such an analysis can be successfully employed, crucially depends on how Vocabulary Insertion is conceptualized. In section 3.1.1 I show that all possible solutions within separational models come with empirical and conceptual drawbacks and should thus be rejected.

3.1.1. Problems for separational models. In order to illustrate the shortcomings of separational models, I will use Distributed Morphology (DM, Halle & Marantz 1993). DM assumes that both word and sentence formation take place in the syntax. Syntactic terminals are thus non-derived, lexically stored elements. As all realizational models, DM uses vocabulary items (VIs) as their source of exponence. Vocabulary items are lexical pairings between morphosyntactic features and phonological content. The insertion of VIs is determined by the Subset Principle:

(14) Subset Principle (Halle 1997, 128)

I. The phonological exponent of a vocabulary item is inserted into a morpheme in the terminal string if the item matches all or a subset of the grammatical features specified in the terminal morpheme. Insertion does not take place if the vocabulary item contains features not present in the morpheme.

II. Where several vocabulary items meet the conditions for insertion, the item matching the greatest number of features specified in the terminal morpheme must be chosen.

Given the possible sets of agreement features in Vata, the set of VIs in (15) must be assumed to accommodate the Subset Principle. Since I do not take a stance on how phonological agreement is determined, I leave it open whether the markers [ɛ/e, ʊ/u, a] are suppletive allomorphs or whether they are derived from a single underlying representation, as in Sande (2018). The notation in (15a) does not represent a theoretical assumption about the lexical representation of the VI(s) to which phonological agreement applies.

Under regular agreement, the Subset Principle makes the correct predictions, as shown in (16).

(15) a. AGR:N ↔ ɛ, ʊ, a b. AGR:N.3P ↔ ɔ
c. AGR:N.PL ↔ ɪ d. AGR:N.3P.PL ↔ wa

(16) a. {√rat.N √red-AGR:N}$_{DP}$ → fulu$^{3.1}$ zal-ʊ$^{1.1}$
b. {√mouse.N.3P} √red-AGR:N.3P}$_{DP}$ → dɔljɔ$^{4.1}$ zal-ɔ$^{1.1}$
c. {√rat.N-PL} √red-AGR:N.PL}$_{DP}$ → ful-i$^{3.1}$ zal-ɪ$^{1.1}$
d. {√mouse.N.3P-PL} √red-AGR:N.3P.PL}$_{DP}$ → dɔlj-a$^{4.1}$ zal-wa$^{1.1}$

In (16a), only the VI in (15a) is applicable, as it is the only one satisfying condition (I) of the Subset Principle. In (16b) both the VIs in (15a, b) satisfy the Subset Principle's condition (I), as (15a) is specified for a subset of the input features, and (15b) is specified for all input features. Since the VI in (15b) is specified for {3P}, it is inserted instead of the less specific VI in (15a), as predicted by condition (II) of the Subset Principle. In the context of (16c), both the VIs in (15a, c) are applicable but (c) is more specific and is thus inserted. In (16d) all VIs satisfy condition (I) of the Subset Principle. The VI in (15d) is inserted because it is the most specific.

The agreement mismatch, however, is challenging for the Subset Principle. As shown in (17), adjectives with the stem vowel [ɔ] trigger the insertion of the VIs in (15b, c) instead of (15d), leaving the features {3P}, in the case of younger informants, and {PL}, in the case of older informants, unrealized, as the inserted VIs are not specified for them (unrealized features are underscored). Although the non-realization of features is a common assumption in DM, the Subset Principle only allows a feature to be unrealized if the most specific VI is not specified for it. However, the most applicable VI in (15d) is specified for {3P} and {PL}. Therefore, the Subset Principle predicts the ungrammatical form *[pɔp-wa], as illustrated in (18).

(17) Agreement mismatch
a. Younger informants: non-realization of {3P}:
{√mouse.N.3P-PL √white-AGR:N.$\underline{\text{3P}}$.PL}$_{DP}$ → dɔlj-a$^{4.1}$ pɔp-ɪ$^{3.4}$
b. Older informants: non-realization of {PL}:
{√mouse.N.3P-PL √white-AGR:N.3P.$\underline{\text{PL}}$}$_{DP}$ → dɔlj-a$^{4.1}$ pɔp-ɔ$^{3.4}$

(18) False prediction by the Subset Principle
{√mouse.N.3P-PL √white-AGR:N.3P.PL}$_{DP}$ → *dɔlj-a$^{4.1}$ pɔp-wa$^{3.4}$

The vowel [ɔ] thus triggers the insertion of a VI that, according to the Subset Principle, is not the most suitable.

The key problem of the Subset Principle and all separational models is that all information required to determine Vocabulary Insertion must be specified within the VIs themselves. Any VI whose application is restricted to a phonological context must be lexically subcategorized to this context. Furthermore, to be inserted in the context {N.3P.PL} in the first place, [ɪ] must be specified for {3P}. If we consider a VI as shown in (19), replacing (15c), the realization of Class 2 as [ɪ] is not predicted anymore, because [ɪ] is specified for {3P}, and therefore condition (I) of the Subset Principle would not allow [ɪ] to realize Class 2 agreement. The only possibility to realize Class 1 agreement would be phonological agreement (15a), as shown in (20a, b), because the VIs in (15c) and (19) do not apply in this context. The agreement marker [ɪ] thus only occurs under Class 1 agreement in the context of the stem vowel [ɔ], as in (20d). Class 1 default agreement would be marked by [wa], as in (20c), just like in the actual Vata grammar.

(19) Agreement marker [ɪ] subcategorized: [AGR:N.3P.PL ↔ ɪ / ɔ(C)_]

(20) Wrong prediction by [AGR:N.3P.PL ⇔ ɪ / ɔ(C)_]

a.	{√rat.N-PL	√red-AGR:N.PL}$_{DP}$	→	*ful-ɪ$^{3.1}$	zal-ɛ̱$^{1.1}$
b.	{√rat.N-PL	√white-AGR:N.PL}$_{DP}$	→	*ful-ɪ$^{3.1}$	pɔp-ɛ̱$^{3.4}$
c.	{√mouse.N.3P-PL	√red-AGR:N.3P.PL}$_{DP}$	→	dɔlj-a$^{4.1}$	zal-wa$^{1.1}$
d.	{√mouse.N.3P-PL	√white-AGR:N.3P.PL}$_{DP}$	→	dɔlj-a$^{4.1}$	pɔp-ɪ̱$^{3.4}$

The same kind of problem would arise if we assumed the subcategorization of the agreement marker [ɔ] in (21) to account for the agreement mismatch in older speakers, as shown in (22): Agreement with singular Class 1 nouns in (22a, b) would wrongly be predicted to be realized as phonological agreement, since the VI in (21) is specified for {PL}, and is thus not applicable anymore.

(21) Agreement marker [ɔ] subcategorized: [AGR:N.3P.PL ↔ ɔ / ɔ(C)_]

(22) Wrong prediction by [AGR:N.3P.PL ↔ ɔ / ɔ(C)_]

a.	{√mouse.N.3P-PL	√red-AGR:N.3P}$_{DP}$	→	*dɔljɔ$^{4.1}$	zal-ʊ$^{1.1}$
b.	{√mouse.N.3P-PL	√white-AGR:N.3P}$_{DP}$	→	*dɔljɔ$^{4.1}$	pɔp-ʊ$^{3.4}$
c.	{√mouse.N.3P-PL	√red-AGR:N.3P.PL}$_{DP}$	→	dɔlj-a$^{4.1}$	zal-wa$^{1.1}$
d.	{√mouse.N.3P-PL	√white-AGR:N.3P.PL}$_{DP}$	→	dɔlj-a$^{4.1}$	pɔp-ɔ$^{3.4}$

In order to attribute the agreement mismatch to the lexical specification of VIs, one would be forced to assume a negative context-specification for the VI that inserts the agreement marker [wa], as shown in (23).

(23) [AGR:N.3P.PL ↔ wa] / ¬ ɔ(C)_]

Given the Subset Principle, the VI in (23) would be given priority to realize Class 1 agreement in all cases, except when the adjective's stem vowel is [ɔ], as the VI in (23) cannot apply in that context. However, such an analysis is not insightful, as (23) is nothing more than a simple restatement of the empirical fact that [wa] cannot co-occur with [ɔ]. Moreover, VIs that are subcategorized to a negative context are generally not assumed in DM.

A possibility to account for the agreement mismatch without subcategorization to phonological content is the formulation of an impoverishment rule which manipulates the morphosyntactic content of adjectives prior to Vocabulary Insertion. Such an impoverishment rule would delete {3P} features on adjectives, if the adjective contains the stem vowel [ɔ]:

(24) {3P} → ∅ / ɔ(C)_

The application of this rule would require a cyclic application of Vocabulary Insertion à la Bobaljik (2000): The root is spelled out first by the VI [√white ↔ pɔp], triggering the application of impoverishment. This is illustrated in (25). After the deletion of {3P} the agreement features are realized by [AGR:N.PL ↔ ɪ], as the VI [AGR:N.3P.PL ↔ wa] cannot apply, as it violates condition (I) of the Subset Principle.

(25) √white-AGR:N.3P.PL → pɔp-AGR:N.3P.PL → pɔp-AGR:N.PL → pɔp-ɪ

The difference between young and old informants must be accounted for by replacing the impoverishment rule in (24) by an impoverishment rule that deletes {PL} instead of {3P}, as shown in (26).

(26) {PL} → ∅ / ɔ(C)_

(27) √white-AGR:N.3P.PL → pɔp-AGR:N.3P.PL → pɔp-AGR:N.3P → pɔp-ɔ

An impoverishment analysis is conceptually problematic: It does not establish a direct link between the phonology of the adjective and the phonology of the agreement marker. The phonological effects shown in (10) and the agreement mismatch cannot be given a unified explanation.

As illustrated in the following section, the assumption that phonological constraints are active at Vocabulary Insertion allows us to provide a unified account for the different agreement mismatches attested for young and old informants, as well as the phonological process in (10).

Another, descriptively accurate solution would be to reject an analysis like in (12) and (13) by simply expanding the list of VIs in (15) by the VIs in (19) or (21). This means that there are two distinct VIs that insert [ɪ] for younger speakers. For older speakers, there would be two VIs that insert [ɔ]. As illustrated in (28) for younger speakers, there would thus be one VI specifying [ɪ] for Class 2 agreement (a) and one VI specifying [ɪ] for Class 1 agreement (b).

(28) a. [AGR:N.PL ↔ ɪ] b. [AGR:N.3P.PL ↔ ɪ / ɔ(C)_]

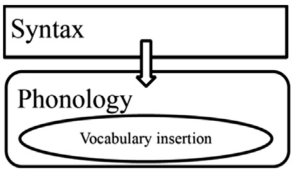
The Subset Principle would then predict that the VI in (28b) is inserted in the context of the agreement mismatch, since it is the most specific applicable VI given its subcategorization to [ɔ] and the morphosyntactic features it realizes. The VI in (28a) would be inserted in the context of Class 2 plural agreement. However, allowing the possibility of homophonous VIs within the same paradigm is problematic, because no restrictions could be made on possible paradigms. Therefore, Bobaljik (2012, 35) proposes an *Antihomophony* bias at language acquisition.

In the next section, it is shown that if we reanalyze the statements in the Subset Principle as violable OT-constraints and assume that these constraints stand in competition with phonological constraints, the agreement mismatch can be insightfully accounted for.

4. AN OT-ACCOUNT

Since a separational approach is challenged by the agreement mismatch in Vata, as shown above, I propose an integrational approach: Following Wolf's (2008, 2015) model of *Optimal Interleaving (OI)*, Vocabulary Insertion applies in an OT component, where phonological constraints are active at the point of Vocabulary Insertion. The overall architecture of grammar is thus the following:

(29) Grammatical architecture



As in DM, word formation applies in the syntax. The syntax is abstract and applies prior to the phonology. The syntactic component provides the input to phonology, where both Vocabulary Insertion and regular phonological processes apply.

4.1. The phonology

After the syntactic computation, the abstract syntactic input is transferred to the phonological component, where Vocabulary Insertion applies. I assume the VIs in (15), repeated in (30).

(30)
a. AGR:N ↔ ɛ, ʊ, a b. AGR:N.3P ↔ ɔ
c. AGR:N.PL ↔ ɪ d. AGR:N.3P.PL ↔ wa

I depart from OI, which is embedded in the framework of Optimality Theory with Candidate Chains (McCarthy 2007, henceforth OT-CC), in that I assume that the phonological computation involves two levels of constraint evaluation. The first level is the *Morphophonological Level*. This is the part of phonology where Vocabulary Insertion applies. At the second level, the *Phonological Level*, regular phonological processes apply.

(31)

Syntax	→	Phonology Morphophonological Level → Phonological Level

Just as separational theories, the model proposed in this paper assumes that Vocabulary Insertion applies before regular phonology. However, the model here is nevertheless integrational, because the Morphophonological Level is part of the phonological component and thus, unlike separational models, the same phonological OT-constraints apply to both Vocabulary Insertion and general phonological processes.

The Morphophonological Level takes the output of morphosyntax and maps it to a string of VIs. This is illustrated in (32):

(32) Morphophonological Level

a. {√mouse.N.3P-PL √red-AGR:N.3P.PL} → [√mouse ↔ dɔljɔ]-[PL ↔ a] [√red ↔ zal]-[AGR:N.3P.PL ↔ wa]

b. {√rat-N.PL √red-AGR:N.PL} → [√rat ↔ fulu]-[PL ↔ ɪ] [√red ↔ zal]-[AGR:N.PL ↔ ɪ]

(32a) shows the Morphophonological Level under Class 1 agreement. The agreement features on the adjective are realized by the VI in (30d). The VI in (30c) is selected under Class 2 agreement, as shown in (32b).

The Phonological Level is the level of regular phonology. It takes the string of VIs created at the Morphophonological Level and maps it to a purely phonological output. At this level general phonological processes like ATR-harmony apply. As shown in (33), ATR-harmony applies at this level to the plural marker which harmonizes for [+ATR] with the nominal stem [fulu]. In addition, the stem-final vowel is deleted in the context of the plural marker.

(33) Phonological Level

a. [√rat ↔ fulu]-[PL ↔ ɪ] [√red ↔ zal]-[AGR:N.PL ↔ ɪ] → [ful**i** zalɪ]

Phonological markedness constraints apply at both levels. However, distinct types of faithfulness constraints apply at each level. As a null hypothesis, I assume that the phonological markedness constraints are the same for both levels and also feature the same ranking among each other at both levels.

The agreement mismatch is created at the Morphophonological Level, as shown in (34a) for younger and in (34b) for older speakers. When the adjective features the vowel [ɔ], the less specific VIs in (30b, c) are inserted over the more specific one in (30d).

(34) Agreement mismatch at the Morphophonological Level

a. {√mouse.N.3P-PL √white-AGR:N.3P.PL} → [√mouse ↔ dɔljɔ]-[PL ↔ a] [√white ↔ pɔp]-[AGR:N.PL ↔ ɪ]

b. {√mouse.N.3P-PL √white-AGR:N.3P.PL} → [√mouse ↔ dɔljɔ]-[PL ↔ a] [√white ↔ pɔp]-[AGR:N.3P ↔ ɔ]

The trigger for the insertion of a less specific VI is a phonological constraint which is violated by the co-occurrence of [ɔ] and [w].

(35) *[ɔ+w]: The segments [ɔ] and [w] must not co-occur.

The domain of *[ɔ+w] is yet to be determined, as well as the exact formulation. Most probably, a deeper investigation of the morphophonology and phonology of Vata would allow for a more general, insightful formulation of this constraint. Since the combination of [ɔ] and [w] is also avoided in offglides, as shown in (10), I assume this constraint to be decisive at the Phonological Level as well in Vata.

In the following sections, I show the components of the OT-evaluation for both levels. I illustrate how the ranking of *[ɔ+w] over competing morphological faithfulness constraints triggers the agreement mismatch for younger and older speakers.

4.1.1. The Morphophonological Level. At the Morphophonological Level, the purely syntactic representation is mapped to a string of vocabulary items. At the Morphophonological Level, GEN is restricted to a single operation: Vocabulary Insertion. The possible candidates are all composed of the VIs of the language in question. This is illustrated in (36) for Class 2 agreement.

(36) The Morphophonological Level

a. Input: output of morphosyntax (hierarchically organized, valued syntactic features)
{√rat.N-PL √red-AGR:N.PL}

b. GEN generates candidates consisting of a linear string of VIs:

Candidate 1:	[√rat ↔ fulu]-[PL ↔ ɪ] [√red ↔ zal]-[AGR:N.PL ↔ ɪ]
Candidate 2:	[√rat ↔ fulu]-[PL ↔ ɪ] [√red ↔ zal]-[AGR:N.3P.PL ↔ wa]
Candidate 3:	[√rat ↔ fulu]-[PL ↔ ɪ] [√red ↔ zal]-[AGR:N.3P ↔ ɔ]
Candidate 4:	[√rat ↔ fulu]-[PL ↔ ɪ] [√red ↔ zal]-[AGR:N ↔ ɛ, ʊ, a]
Candidate 5:	[√rat ↔ fulu]-[PL ↔ ɪ] [√red ↔ zal]

EVAL: markedness constraints, morphological faithfulness constraints

c. Output (string of VIs): [√rat ↔ fulu]-[PL ↔ ɪ] [√red ↔ zal]-[AGR:N.PL ↔ ɪ]

GEN thus generates candidates in which the agreement features on the adjective are realized by one of the VIs in (30) or a candidate in which no VI realizes agreement. A possible candidate at this level can contain all VIs that the lexicon of Vata contains. However, following Trommer (2001), the phonological content that a VI is lexically specified for may not be changed by GEN. The output of the Morphophonological Level thus contains exclusively underlying forms. Phonological changes to the underlying forms apply at the Phonological Level.

In order to incorporate Vocabulary Insertion into OT, these restrictions on GEN are necessary. If GEN was unrestricted, it could not only insert VIs but also change their phonological content and morphosyntactic feature specifications. GEN could thus create vocabulary items to satisfy constraints. In OI, new VIs are not created by GEN, because the insertion of each VI constitutes a single derivational step in both the HS and the OT-CC implementation of this model.

The Evaluator of the Morphophonological Level selects the output by comparing the set of candidates created by GEN regarding their compatibility with ranked constraints. EVAL follows the standard OT algorithm and selects the candidate as the output that features the least serious constraint violations. In (36), Candidate 1 is the winner of the evaluation.

The constraints that apply at the Morphophonological Level include general phonological markedness constraints and faithfulness constraints on morphosyntactic feature realization.[7] The phonological markedness constraints follow the standard formulation of OT-markedness constraints in that they make demands on the phonological structures of output candidates, as in the case of *[ɔ+w] in (35). These constraints are thus blind to the morphosyntactic features within the output VIs. The faithfulness constraints at the Morphophonological Level demand that features in the morphosyntax are realized by vocabulary items. I follow the concept of

[7] Trommer (2001) proposes morphological markedness constraints that penalize the co-occurrence of morphosyntactic features. These constraints do the work of impoverishment rules in classic DM. Adding these types of constraints to the model presented here would not make a difference for the data discussed in this paper.

faithfulness employed in OI. In that framework, faithfulness is evaluated based on correspondence relations (McCarthy & Prince 1995) between morphosyntactic features in the input and those in the output candidates' VIs. Relations of such kind are depicted in (37):

(37) Input: {AGR:N1.PL2} Output: [AGR:N1.PL2 ↔ ɪ]

$\mathfrak{R}$

Two types of faithfulness constraints are assumed: MAX-M(F) and DEP-M(F). Constraints of the type MAX-M(F) demand that if a morphosyntactic feature is contained in the input, it must be realized in the output. Realization of a feature is understood here as correspondence of the relevant input feature to an identical feature in a VI in the output.

(38) MAX-M(F) (Wolf 2008, 26)
For every instance φ of the feature F at the morpheme level, assign a violation-mark if there is not an instance φ' of F at the morph level, such that $\varphi\mathfrak{R}\varphi'$.

Constraints of the type DEP-M(F) demand that VIs in the output must not realize features that are absent in the input. This constraint is violated if a feature in an output VI does not correspond to an identical feature in the input.

(39) DEP-M(F) (Wolf 2008, 26)
For every instance φ' of the feature F at the morph level, assign a violation-mark if there is not an instance φ of F at the morpheme level, such that $\varphi\mathfrak{R}\varphi'$.

These constraints are a subgroup of the standard faithfulness constraints MAX-IO and DEP-IO. As all MAX constraints, MAX-M(F) penalizes deletion (input elements without an output correspondent) and DEP-M(F) militates against epenthesis (output elements without an input correspondent). As DEP-M(F) is violated by epenthesized morphosyntactic features, it makes the same requirement as Part I of the Subset Principle. Since MAX-M(F) is violated by morphosyntactic input features that are not realized in the output, it makes the same demands as the *Superset Principle* in Nanosyntax (Starke 2009). Contrary to the Subset Principle and the Superset Principle, MAX-M(F) and DEP-M(F) are violable.

Other conceptualizations of morphological faithfulness, as for instance the PARSE(FS) constraints in Distributed Optimality (Trommer 2001) could also be employed to account for the agreement patterns in Vata. Contrary to the correspondence-based version adopted here, Trommer assumes that GEN cannot generate output candidates containing features that are absent in the input. Hence, all candidates that violate DEP-M(F)[8] in Wolf's model are universally banned by GEN in Distributed Optimality. Since adjectival agreement in Vata is not assumed to violate DEP-M(F) here, Trommer's conception of faithfulness could also be employed.

For regular Class 1 and Class 2 agreement in Vata, Vocabulary Insertion is only determined by faithfulness constraints, and phonological markedness constraints are not decisive. The

[8] Rolle (2020, 231) introduces the constraint DEP-IO(NODE) which states that "Morphemes in the output correspond to syntactic terminal heads in the input." This constraint thus penalizes feature insertion as well.

output in both cases is determined by the faithfulness constraints MAX-M(PL), MAX-M(3P) and DEP-M(3P) and MAX-M(N). These constraints are provided in (40)–(43). The constraint MAX-M(PL) demands that a {PL} feature in the input must correspond to a {PL} feature in the output.

(40) MAX-M(PL)
For every instance φ of the feature {PL} at the morpheme level, assign a violation-mark if there is not an instance φ' of {PL} at the morph level, such that $\varphi\mathfrak{R}\varphi'$.

MAX-M(3P) demands that {3P} features in the input have a correspondent in the output. DEP-M(3P), on the other hand, militates against {3P} features in the output without an input correspondent. The realization of the {N} feature is demanded by MAX-M(N):

(41) MAX-M(3P)
For every instance φ of the feature {3P} at the morpheme level, assign a violation-mark if there is not an instance φ' of {3P} at the morph level, such that $\varphi\mathfrak{R}\varphi'$.

(42) DEP-M(3P)
For every instance φ' of the feature {3P} at the morph level, assign a violation-mark if there is not an instance φ of {3P} at the morpheme level, such that $\varphi\mathfrak{R}\varphi'$.

(43) MAX-M(N)
For every instance φ of the feature {N} at the morpheme level, assign a violation-mark if there is not an instance φ' of {N} at the morph level, such that $\varphi\mathfrak{R}\varphi'$.

The tableau in (44) illustrates how these constraints determine the realization of Class 2 agreement. For spatial considerations, the noun and its features are not shown in the tableau.

(44) Morphophonological Level of Class 2 agreement

input: {√red-AGR:N.PL}	MAX-M(N)	MAX-M(PL)	MAX-M(3P)	DEP-M(3P)
a. ☞ *zal-[AGR:N.PL ↔ ɪ]*				
b. *zal-[AGR:N.3P.PL ↔ wa]*				*!
c. *zal-[AGR:N.3P ↔ ɔ]*		*!		*
d. *zal-[AGR:N ↔ ɛ, ʊ, a]*		*!		
e. *zal*	*!	*		

The VI containing the {3P} feature in (b) is ruled out by DEP-M(3P), as there is no such feature in the input. Candidate (c) violates both MAX-M(PL) and DEP-M(3P) and is thus ungrammatical as well. Candidate (a) is the optimal candidate since it satisfies all relevant constraints. Since the input in (44) does not contain a {3P} feature, there is no candidate that can violate MAX-M(3P). Candidate (d) is ruled out, as it violates MAX-M(PL) fatally. Candidate (e) does not realize the agreement features through a VI and thus violates both MAX-M(N) and MAX-M(PL) fatally.

The tableau in (45) illustrates Vocabulary Insertion under Class 1 agreement. Due to the {3P} feature in the input, the constraint MAX-M(3P) plays a crucial role.

(45) Morphophonological Level of Class 1 agreement (no agreement mismatch)

input: {√red-AGR:N.3P.PL}	MAX-M(N)	MAX-M(PL)	MAX-M(3P)	DEP-M(3P)
a. *zal-[AGR:N.PL ↔ ɪ]*			*!	
b. ☞ *zal-[AGR:N.3P.PL ↔ wa]*				
c. *zal-[AGR:N.3P ↔ ɔ]*		*!		
d. *zal-[AGR:N ↔ ɛ, ʊ, a]*		*!	*	
e. *zal*	*!	*	*	

MAX-M(3P) assigns a fatal violation mark to candidate (a), because the {3P} feature in the input lacks an output correspondent. Candidate (b) is the optimal candidate. Contrary to the tableau in (44), this candidate does not violate DEP-M(3P), because of the {3P} feature in the input. Candidate (c) does not realize the {PL} feature in the input and is assigned a fatal violation mark by MAX-M(PL). Candidate (d) violates both MAX-M(PL) and MAX-M(3P) as the input features {3P.PL} are not realized. Candidate (e) does not realize any agreement features and thus violates all three MAX constraints. Since the input contains {3P}, no violation is assigned by DEP-M(3P).

It is the presence of phonological constraints at the Morphophonological Level that causes the agreement mismatch, as shown in (46) for younger informants. If no phonological constraints were active at the point of Vocabulary Insertion, the faithfulness constraints in (40)–(43) would predict the ungrammatical candidate *[pɔp-wa] to be optimal. However, *[pɔp-wa] violates the markedness constraint *[ɔ+w], which dominates both MAX-M(3P) and MAX-M(PL). The VI [AGR:N.3P.PL ↔ wa] thus fails to apply. Contrary to (44) and (45), the ranking between MAX-M(PL) and MAX-M(3P) becomes decisive under the agreement mismatch, since one of these constraints must be violated to avoid the insertion of [wa]. In the case of younger informants, the ranking MAX-M(PL) >> MAX-M(3P) triggers the application of the VI [AGR.N.PL ↔ ɪ]. The VI [AGR.N.3P ↔ ɔ] in (c) violates MAX-M(PL) fatally. Phonological agreement, as in candidate (d), violates both MAX-M(PL) and MAX-M(3P) and is thus ruled out. Candidate (e) again violates all MAX-M constraints. Candidate (a) is the winner because it satisfies *[ɔ+w] and satisfies MAX-M(PL) and MAX-M(N). Since MAX-M(N) and MAX-M(PL) dominate MAX-M(3P), the violation of MAX-M(3P) is not fatal.

(46) Agreement mismatch in younger speakers

input: {√white-AGR:N.3P.PL}	*[ɔ+w]	MAX-M(N)	MAX-M(PL)	MAX-M(3P)	DEP-M(3P)
a. ☞ *pɔp-[AGR:N.PL ↔ ɪ]*				*	
b. *pɔp-[AGR:N.3P.PL ↔ wa]*	*!				
c. *pɔp-[AGR:N.3P ↔ ɔ]*			*!		
d. *pɔp-[AGR:N ↔ ɛ, ʊ, a]*			*!	*	
e. *pɔp*		*!	*	*	

As shown in (47), candidate (c) is selected over (b) in the case of older informants. This is due to a reversed ranking between MAX-M(PL) and MAX-M(3P). The violation of MAX-M(3P) committed by candidate (b) is now fatal.

(47) Agreement mismatch in older speakers

input: {√white-AGR:N.3P.PL}	*[ɔ+w]	MAX-M(N)	MAX-M(3P)	MAX-M(PL)	DEP-M(3P)
a. *pɔp-[AGR:N.PL ↔ ɪ]*			*!		
b. *pɔp-[AGR:N.3P.PL ↔ wa]*	*!				
c. ☞ *pɔp-[AGR:N.3P ↔ ɔ]*				*	
d. *pɔp-[AGR:N ↔ ɛ, ʊ, a]*			*!	*	
e. *pɔp*		*!	*	*	

Contrary to a rule-based model like DM, the selection of the VI [AGR:N.PL ↔ ɪ] in the context of the stem vowel [ɔ] does not follow from the VI's lexical specification. It is not specified for adjectives with the stem vowel [ɔ], but its occurrence in this particular context is triggered by the phonological constraint *[ɔ+w]. The insight that a default is chosen over a more specific element for phonological reasons cannot be expressed in a separational model, because the application of a VI is only determined by its lexical specification and the Subset Principle.

In the OT-approach laid out in this section, on the other hand, the application of a VI is determined by faithfulness constraints, referring to its morphosyntactic feature specification and by general phonological constraints, which refer to the phonological content of a VI. Since both morphological faithfulness and phonological markedness constraints are violable, phonological markedness constraints can suppress the realization of morphosyntactic features.

4.1.2. The Phonological Level. The output of the Morphophonological Level is the input to the Phonological Level. At this level phonological processes apply. Phonological processes are defined here as *changes* applying to phonological inputs. Alternations of morphemes resulting from phonological changes that apply to the same underlying form (one VI) thus apply at the Phonological Level. This includes general, exceptionless phonological processes but also those phonological processes whose application is restricted to a subset of the vocabulary, thus *morphologically conditioned* phonology (Inkelas 2014). This stands in contrast to the Morphophonological Level, where VIs are inserted but their phonologically underlying form must *not* be changed. Thus, morphological alternations that include suppletion, hence different VIs, like phonologically conditioned suppletive allomorphy (see below) and the agreement mismatch in Vata, shown above, apply at the Morphophonological Level. How to determine whether a phonological alternation results from suppletion or a (morphologically restricted) phonological process is not always a trivial question. I will not discuss this question here.

A general phonological process in Vata is ATR-harmony. Roots harmonize internally for [ATR] and affixes agree in [ATR] with the stem. Since it applies without exception, ATR-harmony does not involve suppletion and must be assumed to apply at the Phonological Level. A schematic illustration of the Phonological Level is given in (48).

(48) The Phonological Level

a. Input: [√rat ↔ fulu]-[PL ↔ ɪ] [√red ↔ zal]-[AGR:N.PL ↔ ɪ]
b. GEN only generates purely phonological structures:

$$\left\{\begin{array}{ll}\text{Candidate 1:} & \text{[fuli zalɪ]}\\ \text{Candidate 2:} & \text{[fulɪ zalɪ]}\\ \text{Candidate 3:} & \text{[fʊlɪ zalɪ]}\\ \text{Candidate 4:} & \text{[fului zalɪ]}\end{array}\right\}$$

c. EVAL: phonological markedness constraints, phonological faithfulness constraints
Output: [fuli zalɪ]

At the Phonological Level, all candidates created by GEN are purely phonological structures, as in (48b). At this level GEN can create any possible phonological representation as a candidate, as assumed in the Standard theory of OT (Prince & Smolensky 1993). Morphosyntactic information is contained in the input (in the VIs), as in (48a), but not the candidates. Morphosyntactic information is unnecessary at the output of the Phonological Level (48c), as it is not interpreted by the phonetic component and it is not referred to by phonological markedness constraints. The output computed at the Phonological Level is thus always a purely phonological representation.

EVAL evaluates these phonological strings against the same sub-ranking of markedness constraints as in the Morphophonological Level. The faithfulness constraints applying at the Phonological Level, however, demand that the output is faithful to the phonological information in the input. These constraints are the 'traditional' I-O correspondence constraints (McCarthy & Prince 1995). In (48), EVAL selects Candidate 1 as the output. In this candidate, the underlyingly [–ATR] plural marker [ɪ] harmonizes with the adjective's [+ATR] stem and is therefore realized as [i]. In addition, the stem-final vowel is deleted. The replacement of the stem-final vowel by the plural marker must be assumed to happen at the Phonological Level, since the stem-final vowel is not a separate morpheme (as discussed above), which means that the underlying form of the stem /fulu/ is changed.

4.1.3. Justification for two levels in phonology. So far, the division of phonology into a Morphophonological and Phonological Level has not been empirically motivated in this paper. The fundamental prediction of this separation is that Vocabulary Insertion is influenced by phonological constraints and yet strictly precedes regular phonology. The agreement mismatch in Vata does not interact with any phonological process. Therefore, it is not an argument for a particular interaction between Vocabulary Insertion and phonological processes. To defend the assumption of two levels, an empirical observation about *phonologically conditioned suppletive allomorphy* (PCSA) is discussed here.

Just as the model proposed in this paper, OI does not assume a parallel application of phonological processes and Vocabulary Insertion. Wolf's (2008) version of OI has been embedded into Optimality Theory with candidate chains (OT-CC) and Wolf's (2015) version is formulated within Harmonic Serialism (HS) (McCarthy 2000). In both versions, Vocabulary Insertion and phonological processes are interleaved in a serial fashion and thus do not apply parallelly. The assumption of a non-parallel application of phonological processes and Vocabulary Insertion is motivated by the observation that phonological processes may render the selection of phonologically conditioned suppletive allomorphs opaque (Paster 2006; Embick 2010), which is not predicted by a parallel OT model. An example is given in Paster (2006) for Turkish. There, the 3rd person possessive suffix features two allomorphs. The form *-si* is used after vowel-final stems and *-i* is used after consonant-final stems. The selection of the two allomorphs thus results in an optimal syllable structure that avoids codas on the penultimate syllable and provides onsets for final syllables. Note that the quality of the vowel is determined by vowel harmony (Lewis 1967).

(49) a. *-i* after consonant-final stems
bedel-i ‘its price’
ikiz-i ‘its twin’
alet-i ‘its tool’
(Paster 2006, 99)

b. *-si* after vowel-final stems
fire-si ‘its attrition’
elma-sı ‘its apple’
arı-sı ‘its bee’

However, the context for selection is rendered opaque by intervocalic velar deletion (see, for instance, Inkelas 2009), a general process in Turkish. As shown in (50), stems that underlyingly end on [k] take *-i,* which then triggers intervocalic [k]-deletion.

(50) bebe-i /bebek-i/ ‘its baby’

Under the assumption that suppletive allomorphs are separate VIs specified for the same morphosyntactic content, the opaque relationship between PCSA and phonological processes is predicted by the two-level system proposed in this paper and the serial OT model assumed in OI. In both models, opacity can be accounted for by assuming that the insertion of the VI [3P.POSS ↔ i] precedes intervocalic velar deletion. This is shown in (51).

(51) bebek-3P.POSS → bebek-[3P.POSS ↔ i] → bebe-i

In the model presented in this paper, the allomorph *-i* is selected at the Morphophonological Level, where candidates only feature underlying forms. The deletion of [k] applies at the Phonological Level, thus deleting the environment that triggered the insertion of *-i*. In OI, the opacity can be explained by assuming that allomorph selection precedes the deletion of [k], as both are conceived of distinct steps within the serial OT algorithm.

Contrary to the model presented here, HS and OT-CC predict the reverse situation to be possible cross-linguistically, namely that a phonological process may derive the context for the selection of an allomorph. However, as discussed by Paster (2006) and Embick (2010), PCSA is generally determined by underlying phonological forms and not phonologically derived forms. If Vocabulary Insertion universally precedes the general phonology as proposed in this paper, this asymmetric interaction between Vocabulary Insertion and general phonology is accounted for: PCSA applies at the Morphophonological Level and, since general phonological processes apply at the Phonological Level, only underlying phonological forms can determine allomorph selection.

5. CONCLUSION

Contrary to a separational model like DM, the integrational approach laid out in this paper provides an insightful account for the agreement mismatch in younger and older speakers in Vata. The insight that a less specific VI is chosen over a more specific VI for phonological reasons cannot be formulated in a separational model like DM, where the phonological component is not involved in Vocabulary Insertion. Separational solutions show disadvantages. The postulation of impoverishment rules fails to capture the phonological motivation of the agreement mismatch. An analysis that assumes an additional VI, as in (28), allows for homophony of VIs within the same paradigm. This makes it impossible to formulate any restrictions on possible paradigms cross-linguistically (Bobaljik 2012). In the OT-approach laid out in this paper, on the other hand, the application of a VI is determined by faithfulness constraints, referring to morphosyntactic feature specification of VIs, and by general phonological constraints, which evaluate the phonological information that results from Vocabulary Insertion. Both morphosyntactic faithfulness constraints and phonological constraints are violable and thus phonological markedness constraints can suppress the insertion of the most specific vocabulary item. The variation between older and younger informants can be captured by a single reranking of faithfulness constraints.

ACKNOWLEDGEMENTS

This research was funded by the Research Traning Group Nominal Modification (DFG GRK 2016). Many thanks go to my colleagues as well as the PIs for their helpful comments. I would also like to thank the reviewers and editors, as well as the audience at SinFonIJA13 for their helpful comments and suggestions, which helped me to improve the original version of this paper. Furthermore, I would like to thank Caroline Féry and Hannah Sande for the discussions and their support.

REFERENCES

Bennett, Ryan, Emily Elfner and James McCloskey. 2016. Lightest to the right: An apparently anomalous displacement in Irish. Linguistic Inquiry 47(2). 169–234.

Bobaljik, Jonathan David. 2000. The ins and outs of contextual allomorphy. In K. K. Grohmann and C. Struijke (eds.) Maryland mayfest on morphology: University of Maryland Working Papers in Linguistics 10. College Park, MD: Department of Linguistics, University of Maryland. 35–71.

Bobaljik, Jonathan David. 2012. Universals in comparative morphology: Suppletion, superlatives, and the structure of words (Current Studies in Linguistics 50). Cambridge, MA: The MIT Press.

Chomsky, Noam and Morris Halle. 1968. The sound pattern of English (Studies in Language). New York, NY: Harper & Row.

Embick, David. 2010. Localism versus globalism in morphology and phonology (Linguistic Inquiry Monographs 60). Cambridge, MA: MIT Press.

Halle, Morris. 1997. Distributed morphology: Impoverishment and fission. In B. Bruening, Y. Kang and M. McGinnis (eds.) Papers at the interface. Cambridge, MA: MITWPL. 425–449.

Halle, Morris and Alec Marantz. 1993. Distributed morphology and the pieces of inflection. In K. Hale and S.J. Keyser (eds.) The view from building 20: Essays in honour of Sylvain Bromberger. Cambridge, MA: MIT Press. 111–176.

Inkelas, Sharon. 2009. Another look at velar deletion in Turkish, with special attention to the derived environment condition. UC Berkeley PhonLab Annual Report 5. 387–403.

Inkelas, Sharon. 2014. The interplay of morphology and phonology (Oxford Surveys in Syntax & Morphology 8). Oxford & New York, NY: Oxford University Press.

Kaye, Jonathan D. 1981. Les diphtongues cachées du Vata. Studies in African Linguistics 12(3). 225–243.

Kaye, Jonathan. 1982. Harmony processes in Vata. In J. Kaye, H.J. Koopman and D. Sportiche (eds.) Projet sur les langues kru. Montréal: Université du Québec à Montréal (UQAM). 60–151.

Lewis, Geoffrey. 1967. Turkish grammar. Oxford: Oxford University Press.

McCarthy, John. 2000. Harmonic serialism and parallelism. In M. Hirotani, A. Coetzee, N. Hall and J.-Y. Kim (eds.) Proceedings of the North East Linguistics Society. Amherst, MA: Graduate Linguistic Student Association. 501–524.

McCarthy, John J. 2007. Hidden generalizations: Phonological opacity in Optimality Theory (Advances in Optimality Theory). London: Equinox Publishing.

McCarthy, John J. and Alan Prince. 1995. Faithfulness and reduplicative identity. In J. Beckman, L.W. Dickey and S. Urbanczyk (eds.) Papers in Optimality Theory 18. Amherst, MA: Graduate Linguistic Student Association. 294–384.

Nekitel, Otto. 1986. A sketch of nominal concord in Abu' (an Arapesh language). Papers in New Guinea Linguistics 24. 177–205.

Paster, Mary. 2006. Phonological conditions on affixation. Doctoral dissertation. University of California, Berkeley, CA.

Pertsova, Katya. 2015. Interaction of morphological and phonological markedness in Russian genitive plural allomorphy. American Anthropologist 117(3). 599–631.

Prince, Alan and Paul Smolensky. 1993. Optimality Theory: Constraint interaction in generative grammar. Rutgers: Rutgers Center for Cognitive Science.

Richards, Marc D. 2014. Defective agree, case alternations, and the prominence of person. In I. Bornkessel-Schlesewsky, A.L. Malchukov and M. Richards (eds.) Scales and hierarchies. Berlin, München & Boston: De Gruyter Mouton. 173–196.

Rolle, Nicholas. 2020. In support of an OT-DM model. Natural Language & Linguistic Theory 38(1). 201–259.

Sande, Hannah. 2017. Distributing morphologically conditioned phonology: Three case studies from Guébie. Doctoral dissertation. University of California, Berkeley, CA.

Sande, Hannah. 2018. Phonologically determined nominal concord as post-syntactic: Evidence from Guébie. Journal of Linguistics 55(4). 831–878.

Sauvageot, Serge. 1967. Note sur la classification nominale en baïnouk. In G. Manessy (ed.) La classification dans les langues négro-africaines. Paris: C.N.R.S. 225–236.

Smith, Brian. 2015. Phonologically conditioned allomorphy and UR constraints. Doctoral dissertation. University of Massachusetts Amherst, Amherst, MA.

Starke, Michal. 2009. Nanosyntax: A short primer to a new approach to language. Nordlyd 36(1). 1–6.

Stump, Gregory T. 2001. Inflectional morphology: A theory of paradigm structure (Cambridge Studies in Linguistics 93). Cambridge: Cambridge University Press.

Trommer, Jochen. 2001. Distributed optimality. Doctoral dissertation. Universität Potsdam, Potsdam.

Wolf, Mathew A. 2008. Optimal interleaving: Serial phonology-morphology interaction in a constraint-based model. Doctoral dissertation. Amherst, MA: University of Massachusetts Amherst.

Wolf, Matthew Adam. 2015. Lexical insertion occurs in the phonological component. In E. Bonet, J.M. Altimiras and M.-R. Lloret (eds.) Understanding allomorphy: Perspectives from Optimality Theory. Sheffield: Equinox. 361–407.

Zwicky, Arnold M. and Geoffrey K. Pullum. 1986. The principle of phonology-free syntax: Introductory remarks. Ohio State Working Papers in Linguistics 32. 63–91.