

# Phonologically determined agreement in Guébie \*

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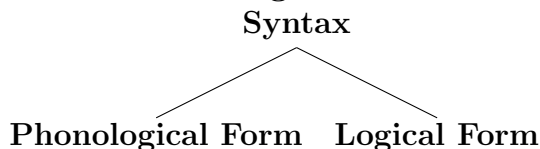
## Abstract

Most current models of grammar assume that syntax has no sensitivity to phonological information (Pullum and Zwicky, 1986, 1988). Phonologically determined agreement, also called alliterative concord, challenges the assumption that syntax is phonology-free, because it appears that phonological form determines morphosyntactic agreement. Here I present a pattern of phonologically determined agreement from Guébie, an endangered Kru language spoken in Côte d'Ivoire, assessing whether phonologically determined agreement is, in fact, phonologically determined. I show that with a combination of Distributed Morphology operations (Halle and Marantz, 1994) plus category-specific phonological grammars (Smith, 2011) via Cophonology Theory (Orgun, 1996; Anttila, 2002; Inkelas and Zoll, 2005), we need not modify our model of syntax as phonology-free. In addition to accounting for phonologically determined agreement in Guébie and across languages, the proposed analysis includes a formal account of ellipsis via constraints at PF.

## 1 Introduction

It is an assumption of most models of syntax that phonological features are not present during syntactic derivations, thus cannot influence syntactic structure (cf. Pullum and Zwicky, 1986, 1988). The Minimalist Program and its predecessors assume that grammar is modeled as in (1) (Chomsky, 1993), where syntactic operations apply entirely before phonological ones. A similar model is assumed by advocates of Distributed Morphology, where morphological operations (including insertion of all phonological information associated with the relevant morphosyntactic features) take place between the syntactic and phonological modules of grammar (Halle and Marantz, 1994; Embick and Noyer, 2001; Harley and Noyer, 1999).

(1) **The Y-model of grammar**



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One phenomenon that challenges the assumption of phonology-free syntax is *phonologically determined agreement*. Here I use the term phonologically determined agreement to refer to a system where agreement (between a verb and its arguments or a noun and its modifiers) is determined by the phonological form of the noun controlling agreement, rather than by its semantic or syntactic features. If agreement takes place in the syntax (Preminger, 2009, 2011), then the existence of agreement dependent on phonological information suggests that phonological features are present in the syntax as well. This would contradict a model where syntax is phonology-free.

A phonological agreement system is found in Guébie, an underdocumented Kru language (Niger-Congo) spoken in Côte d’Ivoire, and I describe it here based on original data. Guébie shows a typologically remarkable phonologically determined agreement system in which nominal concord is determined not by semantic class but by the phonological form of the agreement-controlling noun.

The main goal of this paper is to assess whether phonologically determined agreement is, in fact, phonologically determined. Secondarily, this paper examines whether the phenomenon can be accommodated in theories in which syntax is never sensitive to phonological information. I suggest that indeed such theories can account for phonologically determined agreement, but that the mere existence of the phenomenon weakens the underlying motivation for maintaining that syntax is phonology-free.

Section 2 provides background on the Guébie language, along with an exposition of Guébie phonologically determined agreement. This is followed in section 3 with an analysis of the Guébie data that does not require phonological features to be present in the syntax. The proposed analysis involves interaction between morphology, syntax, and phonology, and proposes a novel approach to ellipsis at PF. Section 4 tests the predictions of the proposed analysis by extending the model to other languages that display similar phonologically determined agreement phenomena. These include other Kru languages, as well as Bainuk (Atlantic) and Abu’ (Arapesh). In section 5 I discuss the implications of the data presented throughout the paper, asking whether phonologically determined agreement systems raise sufficient doubts about the common assumption that syntax is phonology-free. I conclude in section 6.

## **2 Guébie phonologically determined agreement**

### **2.1 Language background**

Guébie is a Kru language spoken by approximately 7,000 people in seven villages in southwest Côte d’Ivoire. It is part of the Dida sub-group of Eastern Kru, closely related to Vata, which is described by Koopman (1984). The people in the seven Guébie villages are subsistence farmers, growing rice and cassava for their families and sometimes growing cacao to sell for profit. Until the late 1990s, the Guébie-speaking villages were isolated with little access to larger cities. However, in the late 1990s, a road was created from Gnagbodougnoa, the largest Guébie-speaking village, to Gagnoa, the nearest city. Gagnoa, a city of more than 200,000 people, is only 31 kilometers from Gnagbodougnoa, and now Guébie speakers have easy access and make regular trips there. The indigenous language of Gagnoa is Bété, a Kru language not mutually intelligible with Guébie. French is the most widely spoken language in the city.

Since having access to Gagnoa, Guébie speakers have begun speaking more French and less Guébie. French is the language taught in schools, used in government, and it is

the lingua franca of all urban areas in the country. It is becoming the norm for children in Guébie villages to learn French before Guébie, thus the language is in critical condition.

The data here come from original work with one Guébie speaker in Berkeley, California and seven others in Gnagbodougnoua, Côte d'Ivoire from September 2013 through July 2017. The majority of the data comes from three speakers, a 28-year-old male, a 35-year-old male, and a 76-year-old male. Three other male speakers ages 35-52 and two female speakers ages 19 and 30 were also consulted. Data was collected in the form of text and elicitation.

## 2.2 Phonologically determined agreement

This section details the phonologically determined agreement system of Guébie, demonstrating that pronouns and adjectives agree with nouns not in semantic class but in phonological features.

Relevant morphophonological and syntactic background information is given here. Basic word order in Guébie alternates between SAuxOV and SVO. When there is no overt auxiliary, the verb surfaces immediately after the subject (Sande, 2017), as in Vata, a closely related Kru language (Koopman, 1984). Like other Kru languages (Marchese, 1979), Guébie is highly tonal, with four distinct lexical tone heights and a number of contour tones<sup>1</sup>. Tone is marked throughout with numbers 1-4, where 4 is high. Syllables are usually CV and maximally CLV on the surface, where L is a liquid. Words other than pronouns must be at least CV. Pronouns take the form of a single vowel. Subject pronouns are free words, but object pronouns are part of the phonological word of the verb, surfacing as enclitics on the element auxiliary, or on the verb in the absence of an auxiliary.

## 2.3 Phonological agreement between nouns and pronouns

Human pronouns in Guébie always take set forms. Specifically, third person pronouns take the form /ɔ<sup>3</sup>/, singular, (2a), and /wa<sup>3</sup>/, plural, (2c). The use of other pronouns is infelicitous when referring to humans, (2b,d).

### (2) Human third-person pronouns

- a.  $\eta\text{udi}^{3.1}=\text{a}^1 \text{ɔ}^3 \quad \text{wa}^2 \quad \text{j}\epsilon\text{r}\epsilon^{3.3}\text{-lil}i^{2.2}$   
 man-DEF 3SG.NOM like.IPFV spice-food  
 ‘As for the man, he likes spicy food.’
- b. #  $\eta\text{udi}^{3.1}=\text{a}^1 \epsilon^3 \quad \text{wa}^2 \quad \text{j}\epsilon\text{r}\epsilon^{3.3}\text{-lil}i^{2.2}$   
 man-DEF 3SG.NOM like.IPFV spice-food  
 Intended: ‘As for the man, he likes spicy food.’
- c.  $\text{a}\text{n}\epsilon^{2.3} \quad \text{no}^1 \quad \text{ɔ}^2 \quad \text{n}\text{ɔ}\text{w}\text{u}^{3.2} \text{la}^2 \text{w}\text{u}^{21} \quad \text{wa}^3 \quad \text{ji}^3$   
 1PL.POSS mother 3SG.POSS brother of children 3PL.NOM come.PFV  
 ‘The children of my mother’s brother, they came.’
- d. #  $\text{a}\text{n}\epsilon^{2.3} \quad \text{no}^1 \quad \text{ɔ}^2 \quad \text{n}\text{ɔ}\text{w}\text{u}^{3.2} \text{la}^2 \text{w}\text{u}^{21} \quad \text{r}^3 \quad \text{ji}^3$   
 1PL.POSS mother 3SG.POSS brother of children 3PL.NOM come.PFV  
 Intended: ‘The children of my mother’s brother, they came.’ (syl.20151113)

<sup>1</sup>See (Sande, 2017) for a more complete description of the tonal system in Guébie, and Gnahore (2006) on tone in a neighboring Kru variety.

Non-human third person pronouns agree with their nominal antecedent not in semantic features like person or number, but in *phonological features*, where the final vowel of the noun stem determines the vowel of the pronoun.

There are ten vowels in Guébie, and all words end in a vowel because there are no licit syllable codas in the language. There are two possible plural suffixes on nouns, /-i/ and /-a/. The final vowel of a noun stem, which is the plural suffix when present, determines the vowel of the pronoun used to replace that noun, as well as the vowel of the possessive pronoun, according to the chart in (1).

Final vowel	3.SG pronoun	Plural suffix <sup>2</sup>	3.PL pronoun
i, ɪ, e, ε	→ ε	-i →	ɪ
ə, a	→ a	-a →	wa
u, ʊ, o, ɔ	→ ʊ		

Table 1: Mapping of Guébie stem-final vowels to pronoun vowels

It is not predictable which noun will take which plural suffix. For example, both *ʃukpə*<sup>3.1</sup>, ‘bracelet’, and *bitə*<sup>2.3</sup>, ‘house’, trigger the central vowel third singular pronoun ə. However, *ʃukpə*<sup>3.1</sup> takes the /-a/ plural suffix, which surfaces as [-ə] due to ATR harmony with the root, *ʃukpə-ə*<sup>3.1.2</sup>, while *bitə*<sup>2.3</sup> takes the /-i/ plural suffix, *bitə-i*<sup>2.3.2</sup>. Because of the unpredictability of the plural suffix given the phonological shape of the noun, I conclude that each noun must be indexed, or lexically specified, for which plural class it falls into. In (1) we see a mapping of non-human nominal final vowels to pronoun vowels. The examples in (3) come from a Guébie text about making plantain fufu, a starchy ball of dough eaten with sauce. Both examples show pronouns agreeing with a non-human antecedent in vowel quality, /i/ in (3a), and /ε/ in (3b). The agreeing element in (3a) is an enclitic object pronoun, while in (3b) it is an emphatic pronoun. The nominal trigger vowel is underlined in all following examples, and agreeing vowels are bold. Full pronoun charts are given in (2, 3, 4).

(3) **Pronoun quality is determined by the final vowel of noun**

- a. a<sup>2</sup>      ʃε<sup>3</sup>      ɲokoli<sup>3.2.2</sup>    ne<sup>4</sup> a<sup>2</sup>      ɲo<sup>3-ɪ</sup><sup>2</sup>  
 2PL.NOM cut.IPFV firewood.PL and 2PL.NOM bring.IPFV-3PL.ACC  
 ‘You cut firewood and you bring them.’
- b. e<sup>2</sup>      ka<sup>3</sup> wa<sup>2</sup>    ne<sup>2</sup>    jεɾε<sup>3.3</sup>    εja<sup>3.1</sup>    ɔbε<sup>3.3</sup>      e<sup>2</sup>      su<sup>2</sup>  
 2SG.NOM IRR want REL pepper with 3SG.EMPH 2SG.NOM grind.IPFV  
**εba**<sup>3.3</sup>      ɓolo<sup>1.1</sup>    bε-a<sup>3.1</sup>  
 3SG.EMPH one    thing-DEF

‘If you want peppers with it, you grind them one at a time.’ (lau.20140606)

The complete subject pronoun chart is given in (2). All pronouns in (2) are shown in their nominative (subject pronoun) forms. Segmentally, object pronouns are identical to subject ones, though tonally they are each one step lower on the 4-tone scale than the corresponding subject pronoun<sup>3</sup>.

<sup>3</sup>Note that in previous version of this work (Sande, 2016) third-person pronouns were written as underlyingly +ATR. Based on new data, they have been reanalyzed as -ATR vowels in all cases, and are written as such here.

Human			Non-human		
	Singular	Plural		Singular	Plural
<b>1st</b>	e <sup>4</sup>	a <sup>3</sup>	<b>1st</b>	–	–
<b>2nd</b>	e <sup>2</sup>	a <sup>2</sup>	<b>2nd</b>	–	–
<b>3rd</b>	ɔ <sup>3</sup>	wa <sup>3</sup>	<b>3rd</b>	ɛ <sup>3</sup> , a <sup>3</sup> , ʊ <sup>3</sup>	ɪ <sup>3</sup> , wa <sup>3</sup>

Table 2: Human and non-human subject pronouns

The pronoun /ɪ<sup>3</sup>/ is the only reconstructed non-human plural pronoun form in Proto-Kru (Zogbo, 2017, 244)<sup>4</sup>. The human pronoun /wa<sup>3</sup>/ comes from Proto-Kru /v+a/, where /\*v/ is the reconstructed human third-plural pronoun, and /\*a/ is a reconstructed aspectual marker. Marchese (1982) argues that the two fused to become the human plural pronoun /wa/ in certain modern Kru languages. In Guébie, the use of /wa/ as a third-person plural pronoun must have been extended to certain non-human nouns over time. Zogbo reconstructs /\*ɔ, \*v/ for human singular and plural pronouns, respectively, and /\*ɛ, \*a, \*v, \*ɪ/ for non-human (p. 246).

There is an additional set of pronouns used solely in emphatic or focused contexts, given in (3). Just like nominative and accusative pronouns, the initial vowel in non-human emphatic pronouns is phonologically determined by the final vowel of the noun.

Human			Non-human		
	Singular	Plural		Singular	Plural
<b>1st</b>	mɔ <sup>3</sup>	apɛ <sup>3.2</sup>	<b>1st</b>	–	–
<b>2nd</b>	mɔmɛ <sup>3.2</sup>	apɛ <sup>2.2</sup>	<b>2nd</b>	–	–
<b>3rd</b>	ɔba <sup>3.2</sup>	waba <sup>3.2</sup>	<b>3rd</b>	ɛba <sup>3.2</sup> , aba <sup>3.2</sup> , ʊba <sup>3.2</sup>	ɪba <sup>3.2</sup> , waba <sup>3.2</sup>

Table 3: Emphatic pronouns

Possessive pronouns, which surface immediately before the possessed noun, are shown in (4), where for non-human possessors, the initial vowel of the possessive marker is phonologically determined.

Human			Non-human		
	Singular	Plural		Singular	Plural
<b>1st</b>	na <sup>4</sup>	anɛ <sup>2.3</sup>	<b>1st</b>	–	–
<b>2nd</b>	na <sup>2</sup>	anɛ <sup>2.2</sup>	<b>2nd</b>	–	–
<b>3rd</b>	ɔnɛ <sup>2.3</sup>	wanɛ <sup>2.3</sup>	<b>3rd</b>	ɛnɛ <sup>2.3</sup> , anɛ <sup>2.3</sup> , ʊnɛ <sup>2.3</sup>	mɛ <sup>2.3</sup> , wanɛ <sup>2.3</sup>

Table 4: Possessive pronouns

The forms in (4) are used for alienably possessed nouns: /na<sup>4</sup> bitə<sup>2.3</sup>/ ‘my house’. A separate set of possessive pronouns are used for inalienably possessed nouns, mostly kinship terms. The inalienable pronouns are identical to the personal pronouns in (2) with one exception; the first person singular inalienable pronoun is /a<sup>4</sup>/ instead of /e<sup>4</sup>/: /a<sup>4</sup> no<sup>4</sup>/ ‘my mother’. The inalienable pronouns are of less interest to us because they are quite infrequently used with non-human pronouns. It is quite rare that a non-human noun (one whose agreement is phonologically determined) is the possessor of an inalienably possessed noun in Guébie.

<sup>4</sup>Also see Marchese (1982)

Human pronouns take set forms, while non-human ones are always phonologically determined by their antecedents. As far as I have seen across various genres of Guébie data, and across speakers, this phonologically determined agreement of third-person pronouns is exceptionless.

In (5) I show examples of this phonologically predictable agreement, where the noun in the left column determines the form of the object pronoun in the center column and the subject pronoun in the rightmost column. The final vowel determining agreement and the pronoun vowels are underlined.

Noun	Gloss	Object	Gloss	Subject	Gloss
a. <u>ji</u> e <sup>2.2</sup>	‘a prison’	e- <sup>4</sup> ni- <sup>4</sup> <u>ɛ</u> <sup>2</sup> ji <sup>3</sup>	‘I see it (prison)’	<u>ɛ</u> - <sup>3</sup> kadɛ <sup>3.2</sup>	‘It (prison) is big.’
b. k <sup>w</sup> ala <sup>4.2</sup>	‘a farm’	e- <sup>4</sup> ni- <sup>4</sup> <u>a</u> <sup>2</sup> ji <sup>3</sup>	‘I saw it (farm)’	<u>a</u> - <sup>3</sup> kadɛ <sup>3.2</sup>	‘It (farm) is big.’
c. to <sup>3</sup>	‘battle’	e- <sup>4</sup> ni- <sup>4</sup> <u>u</u> <sup>2</sup> ji <sup>3</sup>	‘I saw it (battle)’	<u>u</u> - <sup>3</sup> kadɛ <sup>3.2</sup>	‘It (battle) is big.’

Table 5: Phonological agreement of pronouns with antecedents (syl\_20140130)

As above, the antecedent does not have to be in the same utterance, nor nearby in the discourse for this agreement to hold.

Examples of words that fall into each class are given below. Note that there is no semantic distinction between the groups. For example, body parts, animals, large things, and small things are found in all three categories. The word for a small spider species falls into the /ɛ/ category and the word for a large spider species falls into the /a/ category, though neither of these classes is limited to small or large things. ‘Bee’ and ‘honey’, which is derived from ‘bee’, are in the /ɛ/ category, but ‘beehive’, also derived from ‘bee’, is in the /a/ class. Zogbo (2017) discusses possible semantic determinedness for Proto-Kru noun classes, but those semantic distinctions have been lost in Guébie, along with a number of other Kru languages (cf. Bing (1987) on Krahn).

k <sup>w</sup> əli <sup>2.4</sup>	‘face’	ɔk <sup>w</sup> ɪ <sup>2.3</sup>	‘bird species’
ɲote <sup>3.1</sup>	‘yam’	gbele <sup>3.2</sup>	‘cola nut’
nove <sup>2.3</sup>	‘bee’	nove <sup>2.4</sup> -kpe <sup>2</sup>	‘honey’
je <sup>2</sup>	‘leopard’	tɛɛ <sup>3.2</sup>	‘snake’
jak <sup>w</sup> ɛɛ <sup>2.3.2</sup>	‘small spider’	pəpɛ <sup>2.3</sup>	‘leaf’

Table 6: Words that take the front vowel pronoun, /ɛ/

gama <sup>2.2</sup>	‘big spider’	ma <sup>1</sup>	‘butt’
tak <sup>w</sup> a <sup>3.2</sup>	‘basket’	nove <sup>2.4</sup> -guɓə <sup>3.1</sup>	‘bee hive’
jaɓə <sup>3.1</sup>	‘coconut’	ɟukpə <sup>3.1</sup>	‘bracelet’
bitə <sup>2.3</sup>	‘house’	uɓə <sup>3.1</sup>	‘head’

Table 7: Words that take the central vowel pronoun, /a/

nukpu <sup>4.4</sup>	‘quill (pen)’	kasu <sup>3.2</sup>	‘fire’
sabu <sup>3.2</sup>	‘night’	nəpəpɔ <sup>2.4.3</sup>	‘palmwine’
sio <sup>2.2</sup>	‘snail’	gbo <sup>2</sup>	‘dispute’
go <sup>3</sup>	‘abdomen’	takpə <sup>2.3</sup>	‘cheek’

Table 8: Words that take the back vowel pronoun, /ɔ/

There are examples of animals, liquids, large and small objects, round objects, nature, animates, and inanimates in each of the three non-human classes in Guébie, which shows that Guébie noun class assignment is not semantically coherent. However, it is likely that this system stems from a semantically determined Proto-Kru noun class system (Marchese Zogbo, 2012; Zogbo, 2017). Some Kru languages show tendencies for like-things to have the same final vowel, such as Godié (Marchese, 1986b), though others, like Guébie, Tepo (Dawson, 1975), and Krahn (Bing, 1987), show no semantic coherence of classes and are phonologically predictable. It seems that in Guébie, Tepo, and Krahn, at least, the Proto-Kru semantic noun class system has been reanalyzed as a phonologically determined agreement system.

The phonological assignment of nouns to noun classes is not only predictable for Guébie lexical items, but also for loan words (4) and nonce words (5).

(4) **Phonological agreement in loan words from English/French**

- a. sukulu<sup>1.1.3</sup> kɔ<sup>2</sup>-da<sup>1</sup> e<sup>-4</sup> ni<sup>-4</sup> ɯ<sup>2</sup> ji<sup>3</sup>  
 school exist-there. I see.PFV 3SG.ACC PART  
 ‘There is a school. I saw it (the school).’
- b. barazɛ<sup>2.3.2</sup> kɔ<sup>2</sup>-da<sup>1</sup> e<sup>-4</sup> ni<sup>-4</sup> ɛ<sup>2</sup> ji<sup>3</sup>  
 dam exist-there. I see.PFV 3SG.ACC PART  
 ‘There is a dam. I saw it (the dam).’

(5) **Phonological agreement in nonce words**

- a. fo<sup>2</sup> kɔ<sup>2</sup>-da<sup>1</sup> e<sup>-4</sup> ni<sup>-4</sup> ɯ<sup>2</sup> ji<sup>3</sup>  
 Nonce-word exist-there. I see.PFV 3SG.ACC PART  
 ‘There is a NONCEWORD. I saw it (the NONCE).’
- b. gbele<sup>4.2</sup> kɔ<sup>2</sup>-da<sup>1</sup> e<sup>-4</sup> ni<sup>-4</sup> ɛ<sup>2</sup> ji<sup>3</sup>  
 Nonce-word exist-there. I see.PFV 3SG.ACC PART  
 ‘There is a NONCEWORD. I saw it (the NONCE).’ (syl.20140130)

Unlike what Marchese (1986a) describes for Godié, a neighboring Eastern Kru language, there is no default pronoun. The choice of non-human pronoun in Guébie must always agree phonologically with the contextually relevant noun. When a Guébie speaker asks about an unknown object, like “What is it?”, she uses the front-vowel pronoun, /ɛ/ for singular and /ɪ/ for plural “What are those?”. This /ɛ/ is the same pronoun used to replace the word /6e<sup>3</sup>/, ‘thing’, and the /ɪ/ could be replacing plural ‘things’ /li<sup>3</sup>/.

(6) **No default pronoun in Guébie**

- a. (6ɛ<sup>3</sup>) ɛ<sup>3</sup> le<sup>2</sup> na<sup>2</sup>  
 (thing) 3SG.NOM be.IPFV Q  
 ‘What is it/that?’
- b. (li<sup>3</sup>) ɪ<sup>3</sup> le<sup>2</sup> na<sup>2</sup>  
 (things) 3PL.NOM be.IPFV Q  
 ‘What are they/those?’ (gna.20150603)

The choice of nominative pronoun in (6) is determined by the final vowel of the words for ‘thing, things’. This shows the lack of a default pronoun and the full phonological predictability of the Guébie system.

Further evidence for the phonological predictability of this agreement pattern in Guébie comes from definite enclitics. We have already seen that plural suffixes on nouns trigger phonologically agreeing plural pronouns. Other than number-marking suffixes, the only remaining nominal morphology is the definite marker. The exact semantics of overt definite marking in Guébie are as yet not fully understood, though the definite marker appears in a subset of the cases where we would use a definite article in English, and has a subset of the semantic properties of specificity. The definite marker is exponed by an enclitic /=a/ on the noun. It is an enclitic and not a suffix because of both phonological and syntactic properties. Phonologically, /=a/ never undergoes ATR harmony with the root it attaches to, unlike other suffixes. Syntactically, the definite marker can surface on the noun, or whatever phrasal project is in the specifier of the DP. The syntactic structure of the definite marker within a noun phrase in Guébie is discussed further in section 3.2.1. Examples of nouns with definite markers are given in (9).

	<b>Noun</b>	<b>Def noun</b>	<b>Gloss</b>
a.	ɲu <sup>4</sup>	ɲu <sup>4</sup> =a <sup>4</sup>	‘water’
b.	jigo <sup>3.1</sup>	jig <sup>3.1</sup> =a <sup>1</sup>	‘fire’
c.	je <sup>42</sup>	je <sup>4</sup> =a <sup>2</sup>	‘egg’
d.	sukulu <sup>1.1.3</sup>	sukulu <sup>1.1.3</sup> =a <sup>3</sup>	‘school’

Table 9: Definite nouns (lau\_20150617)

When using a pronoun to refer to a noun that would be definite in that same context, the pronoun vowel does not agree with the final vowel of the noun root. Instead, it agrees with the final vowel of the definite marker, /=a/, which results in a central pronoun vowel surfacing, [a], (13).

	<b>Definite noun</b>	<b>Subject pronoun</b>	<b>Gloss</b>
a.	ɲu <sup>4</sup> =a <sup>4</sup>	a <sup>3</sup> , * <sub>U</sub> <sup>3</sup>	‘water’
b.	jigo <sup>3.1</sup> =a <sup>1</sup>	a <sup>3</sup> , * <sub>U</sub> <sup>3</sup>	‘fire’
c.	je <sup>4</sup> =a <sup>2</sup>	a <sup>3</sup> , * <sub>E</sub> <sup>3</sup>	‘egg’
d.	sukulu <sup>1.1.3</sup> =a <sup>3</sup>	a <sup>3</sup> , * <sub>U</sub> <sup>3</sup>	‘school’

Table 10: Definite nouns trigger central pronouns (lau\_20150617)

If each noun were arbitrarily indexed for a particular noun class, we would not expect the definite marker to have any affect on the form of the pronoun. The fact that the presence of the definite marker triggers the central vowel pronoun serves as further evidence that the form of the pronoun is determined by the final vowel of the spelled-out noun.

While speakers are consistent in their judgments of which pronoun should be used to replace a given noun, they avoid constructions where a pronoun replaces coordinated noun phrases like ‘A spider or a bee, it...’. When attempting to coordinate nouns that end in vowels with different backness values, speakers prefer not to choose any pronoun vowel to replace those nouns. Instead, they say that the construction of using a pronoun in such cases would be avoided in natural speech. Indeed, no such examples are found in the Guébie text corpus.



	<b>Noun phrase</b>	<b>Pronoun</b>	<b>Gloss</b>
a.	gama <sup>2.2</sup>	a	‘spider’
b.	tak <sup>2</sup> a <sup>3.2</sup>	a	‘basket’
c.	nove <sup>2.3</sup>	ε	‘bee’
d.	gama <sup>2.2</sup> ɔja <sup>3.1</sup> tak <sup>2</sup> a <sup>3.2</sup>	a	‘spider or basket’
e.	gama <sup>2.2</sup> ɔja <sup>3.1</sup> nove <sup>2.3</sup>	*ɔ, *a, *ε, *ʊ, *I, *wa	‘spider or bee’

Table 11: Pronouns used for coordinated noun phrases (lau\_20150617)

When coordinating nouns that end in the same vowel, speakers have no trouble replacing that coordinated structure with the appropriate phonologically agreeing pronoun (cf. the singular pronoun in disjunctive coordination in 11d). The same is true for two coordinated definite-marked nouns, where the appropriate pronoun vowel is the one which agrees phonologically with the definite marker. However, speakers are not happy with any third-person pronoun in the case of replacing two coordinated nouns that separately trigger distinct pronoun vowels (11e). We might assume that the final vowel of the final noun in the coordinated structure should determine the pronoun vowel, but it seems that speakers instead attempt to come up with a vowel that could replace both the first and second coordinated element, and if no such pronoun vowel exists, the construction is avoided.

## 2.4 Phonological agreement between nouns and modifiers

The same agreement pattern found in noun/pronoun agreement in Guébie also holds between nouns and the final vowel of adjectives that directly modify them, (12).

a.	fi <sup>2.3</sup> le <sup>2.3</sup> jɛ <sup>1.1</sup>	b.	fɪ <sup>3</sup> le <sup>2.3</sup> jɛ <sup>1.1</sup>
	house new red		sponge new red
	‘A new red house’		‘A new red sponge’

Table 12: Noun-modifier phonological agreement (syl\_20151117)

Word-internal ATR harmony influences the quality of the final vowel of the adjectives; however the backness and rounding values of the final vowel are determined by the final vowel of the noun. That is, the difference between the final [ə] on ‘house’ and ‘new’ versus the final [a] on ‘red’ in (12a) is due to ATR harmony with the root. The difference between the final [ə] in ‘new’ in (18a) and the final [o] in ‘new’ in (18b) is due to agreement with the different final vowels of the nouns in (18a) vs (18b).

Adjectives surface after nouns and before numerals within a noun phrase. There are only six adjectives that can directly modify nouns in Guébie, while other modifiers are predicative, surfacing with verbal morphology. Those adjectives that can surface within a noun phrase include ‘big, small, new, red, black, white’. All six of these adjectives can also surface predicatively; but it is only these six adjectives that can directly modify nouns within a noun phrase.

I return to noun-modifier agreement in more detail in Section 4.2.

### 3 An interface model of phonologically determined agreement

While phonologically determined noun class agreement in Guébie could be what remains of a once-semantically determined noun class system, here I focus on the synchronic phonological predictability of the pattern. The proposed model relies on specific interactions between syntax, morphology, and phonology, described in section 3.2. Before detailing the proposal, I first rule out a long-distance phonological approach and three purely syntactic approaches to phonological agreement in section 3.1.

#### 3.1 Considering possible analyses

Based on the facts in section 2, one might consider pursuing a purely phonological analysis in accounting for the Guébie data. This could take the form of long-distance phonological agreement in an Agreement-By-Correspondence (ABC) (Rose and Walker, 2004) analysis. In such a case, we could say that the pronoun and its antecedent are in correspondence and phonological identity is required between the two. However, the phonologically agreeing pronoun occurs even when the noun is not pronounced in the discourse, as in (7).

(7) **Agreement without an overt noun**

- *Context: There are eggplants (trobiə<sup>3.2.2</sup>) on the table. You and your wife are sitting next to the table talking about going to the market, when all of a sudden one eggplant starts to roll off the table.*

- *Response:*

a<sup>3</sup>            ka<sup>3</sup>    brijo<sup>2.3</sup>  
 3SG.NOM PROS fall

‘It is going to fall!’ (lau\_20150604)

In the context above, the word ‘eggplant’, /trobiə<sup>3.2.2</sup>/ has not been uttered aloud; however, the pronoun must surface with the agreeing vowel [a<sup>3</sup>] and not another third-person singular pronoun vowel, \*[ɛ, ʊ, ɔ].

Agreement by Correspondence requires agreeing elements to be overt and within the same local domain so that one element can copy features from the other. Because agreement between a noun and pronoun is required in Guébie even when the noun is not present (7), Agreement by Correspondence is not enough, at least on its own, to account for the phonological agreement of pronouns with nouns in Guébie. Because Guébie nominal agreement is non-local, and the head noun need not be in the same utterance or even in the same discourse for agreement to hold, a long-distance phonological agreement analysis will not suffice (Sande, 2014).

Alternatively, one could consider one of the following purely syntactic accounts:

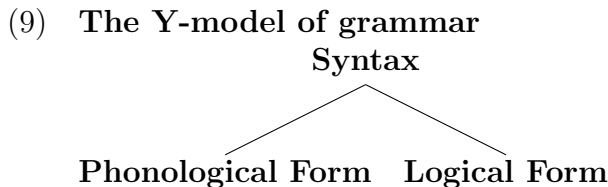
(8) **Possible syntactic analyses of phonological agreement**

1. Phonological features are present in the syntax and available for copying during morphosyntactic agreement processes.
2. Final vowels on nouns, and their agreeing pronoun vowels, are simply arbitrary noun classes that coincidentally surface as entirely phonologically predictable.

3. Phonological agreement is the result of multiple copy spell-out of the noun, as proposed by Dimitriadis (1997) for Bainuk (Atlantic) and Abu' (Arapesh).

I walk through each of these possible analysis, demonstrating that none of them satisfactorily accounts for the Guébie data.

First, option one in (8) requires rejecting the accepted theoretical claim that syntax does not have access to phonological information (Pullum and Zwicky, 1986, 1988). The Y-model of grammar given in (1) is repeated in (9).



There are empirical reasons for adopting the Y-model of grammar, where syntactic operations occur before phonological ones, and syntax has no access to phonological information. An analysis where phonological features are present during the syntactic module makes pathological predictions; if syntax was sensitive to phonology, we would expect word orders and other syntactic phenomena to be sensitive to phonological features such as segmental properties. Such phenomena are not found across languages.

The objection to this particular analysis is an architectural one. A model of grammar which disallows syntactic sensitivity to phonological features, like the Y-model, is more restrictive than one which allows phonology to affect syntactic operations.

Option two above is entirely arbitrary, where all lexical items are indexed for noun class, and the fact that the phonological form of the pronoun is predictable given the form of the noun is coincidental. While this analysis is feasible, it assumes that all noun class assignments are memorized rather than fully productive. Additionally, this analysis predicts exceptions to the phonological predictability of the Guébie agreement system, which we do not see in the data. In Bantu languages we find two different /*mu-*/ noun class prefixes. These prefixes surface on the noun, and for one of the two *mu-* forms, there is a phonologically identical *mu-* which surfaces on agreeing elements in the noun phrase (ex: Class 18 in Ganda). However, there are other nouns which take a *mu-* prefix but trigger phonologically distinct prefixes on agreeing elements (ex: Class 1 in Ganda) (Meeussen, 1967). We never see such non-phonological agreement in the Guébie system.

A particularly problematic set of data for this analysis comes from nouns marked for definiteness, which always trigger the central vowel pronoun, agreeing with the definite marker, /*=a*/ rather than the noun itself.

	<b>Noun</b>	<b>Agreeing subject pronoun</b>	<b>Gloss</b>
a.	sukulu <sup>1.1.3</sup>	ʊ <sup>3</sup>	‘school’
b.	sukulu <sup>1.1.3=a<sup>3</sup></sup>	a <sup>3</sup> , *ʊ <sup>3</sup>	‘the school’

Table 13: Definite enclitics trigger central vowel phonological agreement

The definite marker is used in a narrower set of contexts in Guébie than, for example, in English. However, when referring to a noun that would take the definite marker, the central vowel pronoun must be used.

If each noun was indexed for a particular lexical class, there would be no a priori reason to predict that the definite marker should suppress the noun class agreement

triggered by the noun itself. We might expect that the diacritic on the noun would still determine noun class. However, a phonology-based analysis accounts for this data without additional stipulation, and even predicts that the presence of a definite enclitic should have this affect.

An analysis of arbitrarily assigned noun classes might also predict a default noun class for loan words or certain semantic categories. These predictions are not born out in Guébie. An arbitrary noun class analysis fails to capture the generalization that all noun-pronoun agreement is phonologically predictable; a better analysis would predict this agreement, rather than write it off as coincidental.

Option 3 above says that phonological agreement results from multiple copies of the noun being spelled out, some of which can be reduced to the final vowel of that noun. Dimitriadis (1997) proposes a version of this analysis for phonologically determined agreement in Bainuk (Atlantic) and Abu' (Arapesh).

On this analysis, for the Guébie noun phrase 'new red house' in (10), we would need to say that there are three copies of the noun, one which surfaces as a full copy, and two at the end of each adjective, which are reduced to the final vowel of the noun.

(10) **Multiple copy spell-out of nouns in Guébie**

ʃitə<sup>2.3</sup> lel-ʃitə<sup>2.3</sup> ʒel-ʃita<sup>1.1</sup>  
 house new-house red-house  
 'new red house'

A Guébie noun phrase like (10) would require three copies of the noun to be present in the syntactic structure, where one of them is fully pronounced and the other two are partially pronounced. The problem is that there is no supporting evidence, syntactic or morphophonological, for such redundancy in Guébie. This analysis is uneconomical and unmotivated, and an alternative analysis is preferred if possible. Additionally, this analysis predicts the existence of some language in which multiple copies of the noun exist and are fully pronounced on the surface. To my knowledge, this pattern is not attested.

### 3.2 The proposed model

Here I propose a novel model of phonologically determined agreement which relies on specific interactions between morphology and its interfaces. Unlike the above analyses, the model proposed here predicts the phonological determinedness of the Guébie system, and it does not require syntax to be sensitive to phonological features. In addition to accounting for phonologically determined agreement in a manner compatible with current linguistic theories, this model also explicitly details how ellipsis occurs at PF. I focus here on deriving pronoun agreement, and I leave adjectival agreement to section 4.2.

The proposed analysis assumes a Distributed Morphology style model of grammar, where syntax precedes morphological operations which precede phonology (Halle and Marantz, 1994).

Here I briefly summarize the analysis to come. I claim that an agreement-controlling noun is always present covertly, and sometimes overtly, in a noun phrase. This noun conditions phonologically determined agreement. The nominal agreement trigger may or may not actually be pronounced, but either way it is present in the syntax and the pronoun agrees with it morphosyntactically and phonologically. During the morphological component, an Agr(eement) node is inserted on the pronoun, and features of the noun

are copied to it. The phonology, which applies at phase boundaries, has access to the morphosyntactic features of heads within that phase, and phonological constraints ensure phonological identity between those heads in the DP which agree in specific features. Ellipsis of the noun optionally occurs at PF, licensed by overt phonological agreement between the noun and the pronoun. The proposed analysis is outlined by the (simplified) diagram in (14) and is detailed in the remainder of this section.

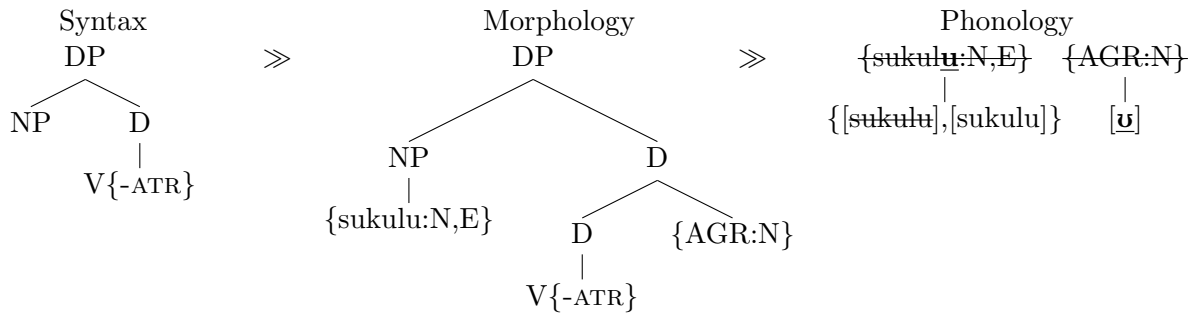


Table 14: Diagram of the proposed analysis

The structure in (14) is a simplified version of the model to be proposed in the following sections. In section 3.2.1 I provide more information about the syntactic structure of noun phrases in Guébie, which is necessary for a full understanding of the morphological and phonological analyses of phonologically determined agreement. In 3.2.2 I discuss the morphological component, based in Distributed Morphology, and in section 3.2.3 I provide a formal analysis of phonologically determined agreement in Guébie, reliant on morphosyntactic features being maintained through the morphology, available to the phonological component. The feature bundles in (14) include N (noun) features, as well as E (ellipsis) features, which are explained in more detail in sections 3.2.2 and 3.2.3.

### 3.2.1 The syntactic structure

Before detailing the full analysis of noun class agreement in Guébie, I provide more information on DP structure in the language in general.

There are two well-formed surface orders of full noun phrases, given in (11). Note that the definite marker can either surface on the noun itself, with numeral and adjective surfacing after the definite-marked noun, or the definite marker can surface at the end of the noun phrase. Examples of each of the grammatical orders are given in (12a,b).

- (11) **Noun phrase order in Guébie**
- a. NOUN-DEF NUMERAL ADJ
  - b. NOUN ADJ NUMERAL-DEF

(12) **Two possible word orders in noun phrases**

- a. NOUN-DEF NUMERAL ADJ
- gama-I-a<sup>3.3.2.2</sup> mɔna<sup>2.31</sup> jal<sup>2.2</sup>  
 spider-DEF four red  
 ‘the four red spiders’

- b. NOUN ADJ NUMERAL-DEF

gama-ɪ<sup>3.3.2</sup> ʒali<sup>2.2</sup> mɔna-a<sup>2.3.1</sup>  
 spider red four-DEF

‘the four red spiders’

- c. NOUN-DEF ADJ NUMERAL

\*gama-ɪ-a<sup>3.3.2.2</sup> ʒali<sup>2.2</sup> mɔna<sup>2.3.1</sup>  
 spider-DEF red four

Intended: ‘the four red spiders’

- d. NOUN NUMERAL ADJ-DEF

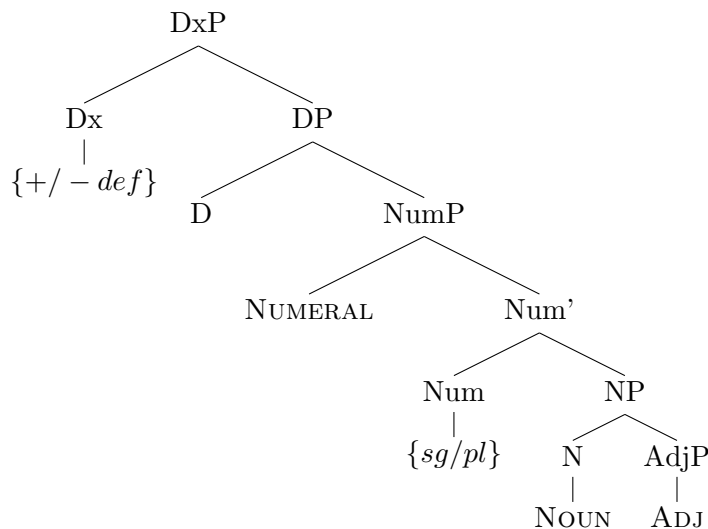
\*gama-ɪ<sup>3.3.2</sup> mɔna<sup>2.3.1</sup> ʒali-a<sup>2.2.2</sup>  
 spider four red-DEF

Intended: ‘the four red spiders’ (syl\_20170322)

Note that when the noun is immediately followed by a definite marker, the order of the other elements in the noun phrase can only be numeral»adjective (12a), \*adjective»numeral (12c). However, the order adjective»numeral is fine if the definite marker surfaces at the end of the noun phrase, as a clitic on the numeral (12b). In such cases, it is ungrammatical to have \*numeral»adjective=def order (12d). Marchese-Zogbo (p.c.) reconstructs the order in (11b) to Proto-Kru, based on the fact that NOUN ADJ NUMERAL order is found across the Kru family. Both of the above orders are used in natural speech in Guébie, and both are judged grammatical in elicitation tasks.

The surface orders in (11) can be analyzed as having a syntactically head-initial DP, (13).

(13) **Head-initial Guébie DP**

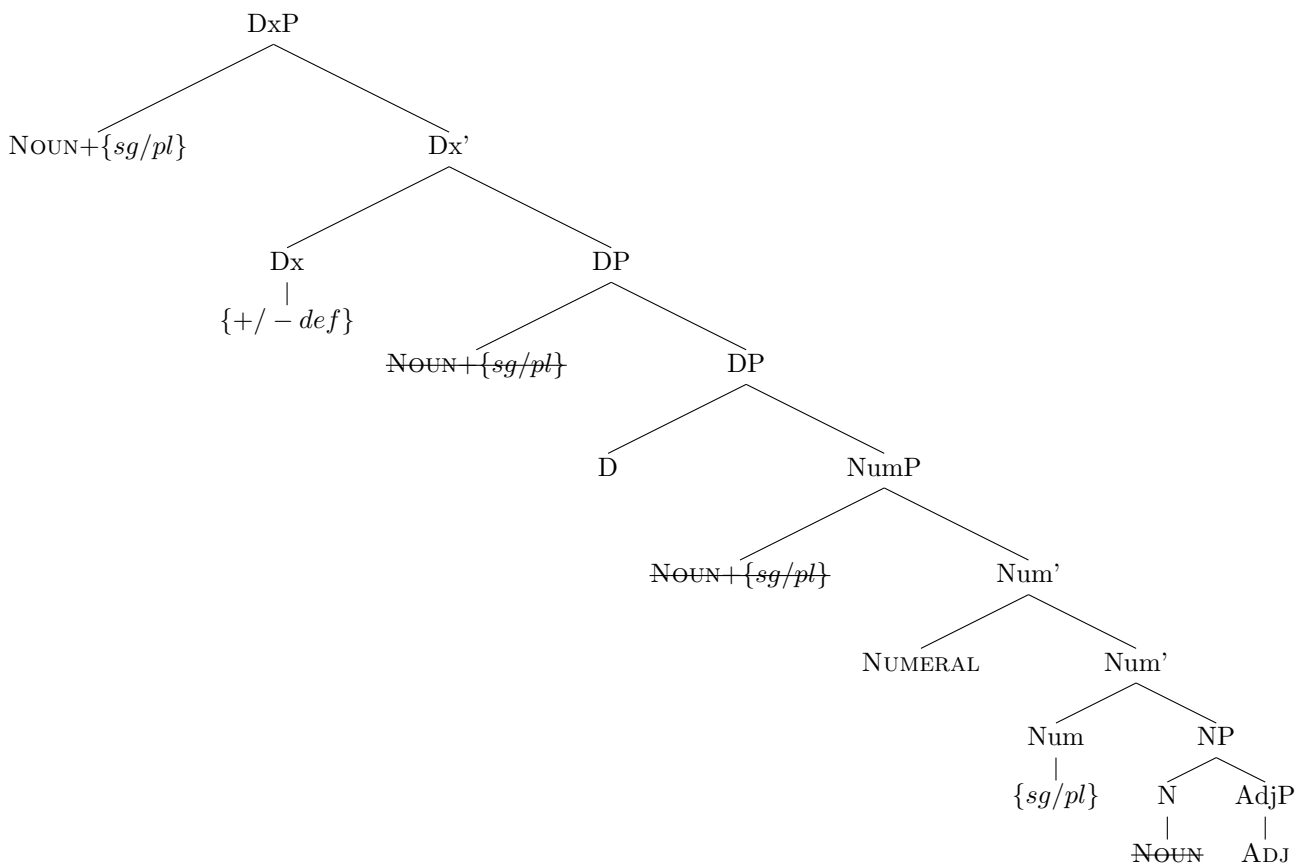


I assume bare phrase structure (Chomsky, 1994) but use X for terminal nodes, X' for intermediate nodes, and XP for maximal projections throughout in order to differentiate between the three in prose. I follow Ioannidou and Den Dikken (2009) in using DxP to represent the definite projection. This convention goes back to Lyons (1999); Szabolcsi

(1994); Pesetsky and Torrego (2001). D in the following structure is ultimately where pronouns are introduced. DP here could be thought of as a PhiP in Déchaine and Wiltschko (2002)'s terms, and is even in the same structural position as PhiP in Dechaine and Wiltschko's analysis. I first discuss the structure of DPs without pronouns.

In (11a) the noun has moved via morphological merger (*m-merger*) (Embick and Noyer, 2001; Bobaljik, 2002; Matushansky, 2006) from the most embedded position in the noun phrase, through the specifier of Num, where it picks up singular/plural features, through spec-D, to the specifier of the definite-marking head, as shown in (14). The definite marker then cliticizes onto the noun in its specifier position. This head-movement analysis has been proposed for Bantu (Carstens, 2000), which shows the same surface DP order.

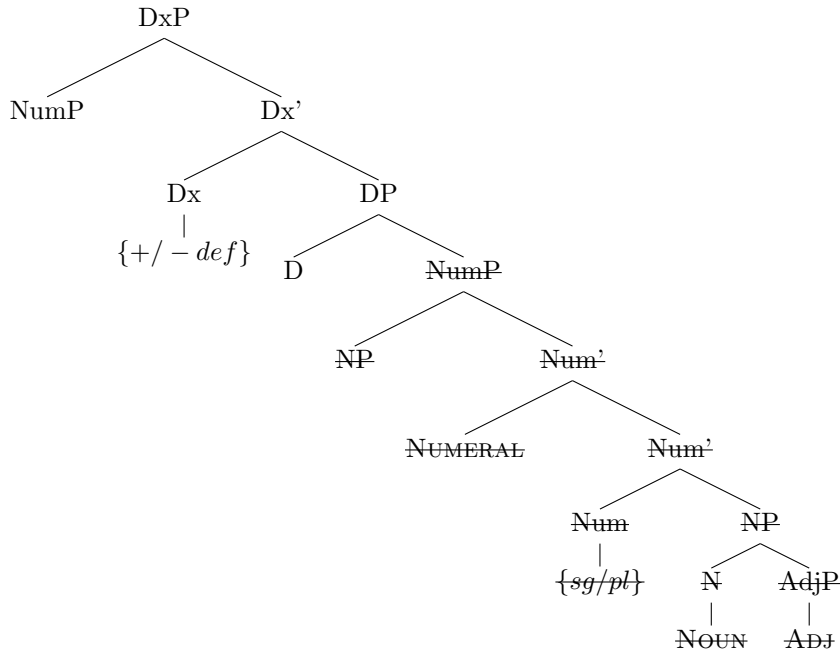
(14) Head movement DP structure



The result of head movement and *m-merger* as in (14) is the word order NOUN-DEF NUMERAL ADJ, (11a), where the definite marker is a clitic on the noun, and the numeral and adjective surface in their base positions.

To arrive at the surface order in (11b), instead of movement of only the noun, we see phrasal movement of the NP to spec-Num, such that the order is then NOUN ADJ NUMERAL. Then the entire NumP moves to spec-DxP. The definite marker, the head of the DxP, cliticizes to the entire NumP in its specifier position, with the surface result that the definite marker is an enclitic on the numeral. We have no evidence to determine whether NumP stops in spec-DP before moving up to spec-DxP.

(15) Roll-up DP structure



The tree in (15) results in the surface order NOUN ADJ NUMERAL-DEF, where the definite marker is a clitic on the phrase in its specifier position.

Now that we have covered the structure of full noun phrases, we can ask about the structure of pronouns. To do so, let us first consider the distribution of pronouns with nouns and definite markers in Guébie noun phrases.

Pronouns in Guébie can occur alone within a noun phrase, (15b), or can occur together with an overt noun, (15c). For some speakers, that noun can optionally be marked with a definite agreement suffix (15e). For others, the definite marker can never co-occur with the pronoun. Unlike pronouns, definite markers cannot surface without an overt noun, (15f). For both groups of speakers, adjectives and numerals are impossible in noun phrases that contain a pronoun, (15g,h).

a.	sukulu <sup>1.1.3</sup>	‘school’
b.	ɔ <sup>3</sup>	‘it’ (the school)
c.	sukulu <sup>1.1.3</sup> ɔ <sup>3</sup>	‘it school’
d.	sukulu-a <sup>1.1.3.3</sup>	‘the school’
e.	?sukulu-a <sup>1.1.3.3</sup> ɔ <sup>3</sup>	‘it the school’
f.	*a, *a ɔ <sup>3</sup>	‘the (school)’
g.	*sukulu <sup>1.1.3</sup> ɔ <sup>3</sup> lelu <sup>2.3</sup>	‘it new school’
h.	*sukulu <sup>1.1.3</sup> lelu <sup>2.3</sup> ɔ <sup>3</sup>	‘it new school’

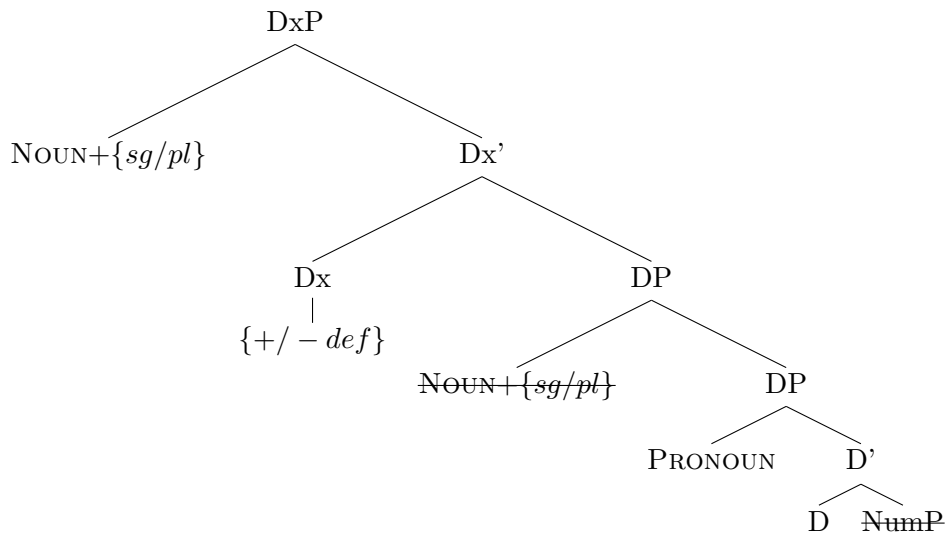
Table 15: Distribution of nouns and pronouns (lau\_20150617)

Constructions like (15c), where the noun and pronoun surface together within the same noun phrase, are similar to the ‘we linguists’ construction in English, except that in Guébie they are not restricted to first and second persons. This noun-pronoun construction is distinct from topic, focus, and definiteness in Guébie, though I leave its exact semantic interpretation for future work.



Following Elbourne (2001)'s analysis of e-type pronouns, I assume that pronouns take a noun phrase complement which is elided at PF. In Guébie the noun head-moves to a functional position above the pronoun, as in (14), and the complement of the pronoun (the NumP) is elided. The complement of the pronoun includes any numerals or adjectives present. This accounts for why we never see an overt adjective or numeral when a pronoun is present. The noun, which has head-moved to a higher position, is optionally elided (where ellipsis is licensed by the presence of the pronoun), resulting in all and only the two grammatical overt pronoun structures, (15b,c).

(16) **The structure of pronoun DPs**



I have left the elided material below NumP out of the tree in (16), for simplicity.

Following Giusti (2002) I assume that pronouns and determiners other than the definite marker, when they occur, are specifiers of DP. The noun moves through spec-Dx via *m*-merger and lands in spec-Dx, so that the noun is no longer in the complement of D. The complement of D is elided when a pronoun is present, leaving only the noun, with definite marking if it is a definite context, and the overt pronoun.

For those speakers who allow the definite marker to co-occur with pronouns in specific contexts, we need not say anything additional. The definite marker /=*a*/ cliticizes onto the noun in its specifier position. For those speakers who do not allow the definite marker and pronoun to co-occur, we could posit a morphological filter on having both morphemes present in the same derivation. In either case, pronouns sit in some functional position, here D, separate from the definite marker within the noun phrase (Postal, 1966; Elbourne, 2005; Arkoh and Matthewson, 2013).

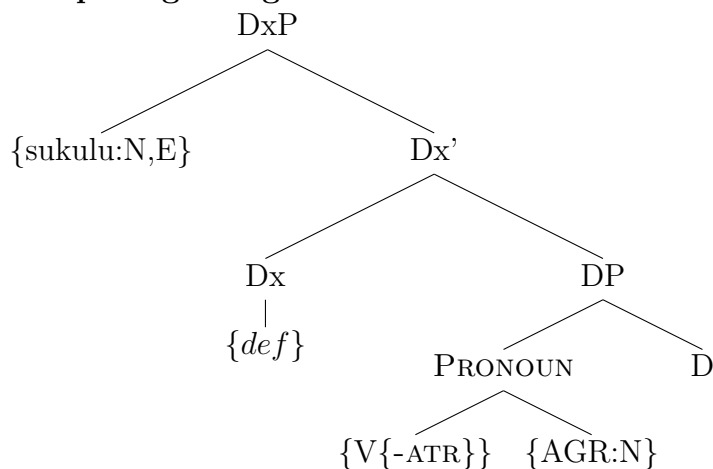
Returning to phonological agreement, whenever a pronoun is produced, it agrees in phonological content with the noun in the same noun phrase, whether or not that nouns is overt at PF. I propose that this phonological agreement is conditioned by morphosyntactic agreement between the noun and pronoun. That is, the pronoun probes for some feature, say a noun feature {N}, and the two are in a syntactic agreement relationship. At each syntactic phase boundary morphological and phonological operations take place (Marvin, 2002), and crucially DP (here DxP) is a phase, (Svenonius, 2004).

### 3.2.2 The morphological structure

In the proposed model, morphology and phonology apply cyclically to syntactic structures by phase (Marvin, 2002), and each DP (here DxP) is a phase (Svenonius, 2004). The morphology takes the structure in (16) as an input. Via regular Distributed Morphology agreement mechanisms, an AGR-node is inserted on X, and the [N] feature is copied to it from the noun (cf. Halle and Marantz, 1994). Node insertion in Distributed Morphology occurs only when the relevant morphological features have no bearing on semantics. That is, only those terminal nodes which affect the truth value of the sentence are present in the syntax, and others are inserted during the morphological module of grammar. See Norris (2014) for a previously analyzed case of nominal concord where AGR-nodes are inserted in the morphological component.

Agreement proceeds as shown in the noun-pronoun construction in (17) for the noun *sukulu* ‘school’. The vocabulary item *sukulu* has the feature {N} because it is a noun, and the feature motivating optional ellipsis at PF, which following Merchant (2001, 2008) I call {E}. The {E} feature is discussed further in section 3.2.3. The noun feature of *sukulu* has been copied to the AGR node on D. Because the shape of pronouns, whether human or non-human, is always a vowel, V, I assume that the non-human pronoun vocabulary item is a vowel specified for the phonological feature {-ATR}, but underspecified for other features, specifically {BACK}. The backness value will be specified via the constraint-based phonology<sup>5</sup>.

(17) **Morphological agreement**



For simplicity, I leave out the syntactic nodes below D, the projection introducing the pronoun, in (17).

For the majority of terminal node feature bundles in Guébie, there is some lexically associated phonological content. This content can be fully specified, as in ‘school’, /*sukulu*<sup>1.1.3</sup>/, or partially specified, as in third-person non-human pronouns, /V{-ATR}/. We also predict, then, that there could be a set of features for which there is no corresponding phonological content. This is seen elsewhere in Guébie, where the imperfective

<sup>5</sup>The shape of the pronoun as a single vowel could also be derived via phonologically optimizing constraints such as REALIZEMORPH and \*STRUCTURE, which would result in the minimal possible output content (a single segment) that still results in output realization of each input morpheme. However, because even human pronouns, which are fully specified vocabulary items (discussed further in section 4.1), have the shape of a vowel, I assume that the V shape of even non-human pronoun is specified in the lexicon.

morpheme triggers a particular phonological process, but is not associated with any underlying phonological content (Sande, 2017, ch. 5).

After vocabulary items and AGR-nodes are inserted, the morphological structure in (17) is linearized via Distributed Morphology Linearization mechanisms (as laid out by Embick (2010)). Note that in the proposed analysis, the morphological features associated with terminal nodes are preserved through morphology, including Linearization, and are available to the phonology (following Gribanova and Harizanov (2015); Winchester (2016); contra Halle (1990); Bobaljik (2000)).

### 3.2.3 The phonology

Here I adopt a constraint-based approach, combining Cophonology Theory (Itô and Mester, 1995; Anttila, 2002; Inkelas and Zoll, 2005) with paradigm output-output faithfulness (Burzio, 1994; Benua, 1997; Kager et al., 1999).

The choice of Cophonology Theory is crucial here, because it allows for distinct morpheme-specific phonological grammars, as opposed to a single grammar which applies across all constructions in a given language. While I choose to show each cophonology evaluated in parallel, a cyclic approach using strata, like Stratal OT (Kiparsky, 2000, 2008; Bermúdez-Otero, 1999), or serial derivation, like Harmonic Serialism (McCarthy, 2000) would work equally as well as the parallel approach provided here. Since my point here is not to choose between a parallel and stratal or serial phonology, but rather to show that a model of grammar where phonology follows syntax and is sensitive to morphosyntactic features can account for phonologically determined agreement, I set aside the differences between stratal or serial and parallel approaches and use parallel evaluation for simplicity.

In this model, phonology applies at phase boundaries, and DP (DxP) is a phase. Thus, the entire DP will be evaluated simultaneously by phonological constraints. For Guébie, phonological agreement applies within a DP, but not within other spell-out domains. This resembles the cross-linguistic pattern noticed by Smith (2011) that morphophonology tends to differ between nominal and other contexts. Cophonology Theory easily predicts this kind of difference in phonological phenomena across constructions within the same language. There are two construction-specific grammars relevant for our purposes: the phonological constraint ranking that applies within DPs, and the one that applies elsewhere. I focus first on the DP-specific grammar.

The linearized structure provided by the morphological component of grammar serves as the input to phonology on this model. This linearized structure consists of vocabulary items and morphosyntactic features, (18). Note that there is no specified pronoun vowel in the input to the phonological component. The quality of the pronoun will instead be determined via ranked constraints.

- (18) **Morphosyntactic input to phonology**  
 {sukulu:N,E} {V{-ATR}:AGR:N}

To arrive at the correct output [sukulu u] or [sukulu u] based on the linearized input in (18), we need a constraint within the DP cophonology ensuring identity between the final vowel of the noun and the vowel of the pronoun. This is accomplished with ANCHOR-R, which anchors agreement to the right edge of a word, (19).

- (19) **Anchor-R** (McCarthy and Prince, 1993)  
 Segments at the right edge of agreeing heads correspond.

This constraint is only active if the heads in question agree in some morphosyntactic feature. If they do agree morphosyntactically, segments at the right edge of each head will correspond. We also need a constraint ensuring that heads in correspondence are phonologically identical. I propose an output-output identity constraint IDENT-OO which says that heads that agree in the feature N must agree in phonological features.

(20) **Ident-OO** (Benua, 1997)

Assign one violation for each set of corresponding heads that Agree in some morphosyntactic feature and are not phonologically identical.

The IDENT-OO constraint will be crucially dominated in other cophonologies, since it is only in the DP domain that we see phonological agreement across elements that agree morphosyntactically.

The combination of the two constraints in (19, 20) has the result that two heads agreeing in the morphosyntactic feature N within the same spell-out phase will be phonologically identical, starting from the right edge of the word. The optimal candidate violates a single constraint here, namely DEP-FEATURE, which penalizes output features not present in the input. DEP-FEATURE is violated by the optimal candidate because the pronoun vowel has fully specified vowel features in the output, but not in the input. The benefit of DEP-FEATURE is that it rules out candidates like [sukulu sukulu] where the pronoun is identical to the noun in more than just one segment, because [sukulu sukulu] involves more output features without corresponding input features than does [sukulu *ʊ*].

(21) **Dep-feature** (McCarthy and Prince, 1993)

Assign one violation for each feature in the output that lacks a corresponding input feature.

The tableau below shows that the presence of IDENT-OO rules out a pronoun vowel that does not agree phonologically with the noun (16d). ANCHOR-R rules out a pronoun that is phonologically identical to the left edge of the noun (16c). DEP is necessary to rule out a pronoun that is identical to the entire phonological form of the noun, or even anything more than the final vowel (16b). Here I mark a single violation of DEP for each segment present in the output that was underspecified or not present in the input. This decision is for simplicity of reading the tableaux, because in fact each candidate below would incur many more DEP-FEATURE violations than marked—one for every phonological feature inserted, rather than one for every consonant/vowel segment inserted. The justification for the ranking in (16) follows.

{sukulu:N,E} {V{-ATR}:N}	ID-OO	ANCHOR-R	DEP-FEATURE
a. sukulu <i>ʊ</i>			1
b. sukulu sukulu			6!
c. sukulu s <i>ʊ</i>		*!	2
d. sukulu <i>ɛ</i>	*!		1

Table 16: IDENT-OO, ANCHOR-R ≫ DEP

The combination of the correspondence constraint ANCHOR-R and the identity constraint IDENT-OO function to rule out candidates that fail to agree, as per Agreement-by-Correspondence Theory (Hansson, 2001; Rose and Walker, 2004).

While the tableau in (16) rules out a number of unwanted candidates, without an additional constraint, the candidate [sukulu] with a null pronoun would beat the optimal candidate because it involves no feature insertion. We must ensure that the pronoun surfaces overtly, despite its lack of fully-specified phonological feature information in the input. This can be assured with a **REALIZEMORPHEME** constraint, which penalizes an output candidate that does not overtly realize an input morpheme, (22).

- (22) **RealizeMorph(eme)** (Samek-Lodovici, 1993; Rose, 1997; Walker, 2000; Kurisu, 2001)

Assign one violation for each input morpheme that is not phonologically realized in the output.

{sukulu:N,E} {V{-ATR}:N}	ID-OO	ANCHOR-R	REALIZEMORPH	DEP-FEATURE
a. sukulu $\upsilon$				1
b. sukulu			*!	

Table 17: IDENT-OO, ANCHOR-R, REALIZEMORPH

While the constraints in (17) explain why we get a surface pronoun that is a single segment and agrees with the final segment of the noun, they do not explain why the features of the final vowel of the output noun are identical to the input features. That is, why don't we have an optimal output candidate [sukule  $\epsilon$ ]<sup>6</sup>? This is solved with a highly ranked IDENT-IO constraint.

- (23) **Ident-IO** (McCarthy and Prince, 1995)

Assign one violation for each output segment whose features differ from the corresponding input segment.

The full Guébie vowel inventory contains ten vowels, [i, ɪ, e, ε, u, ʊ, o, ɔ, ə, a], but there are fewer possible singular non-human pronoun vowels, [ε, a, ʊ]. The specified {-ATR} feature on the pronoun vocabulary item limits the possible pronoun vowels to [ɪ, ε, ʊ, ɔ, a]. Additional constraints such as PERIPHVOWEL preferring peripheral vowels [ɪ, ʊ, a] and \*I dispreferring the output segment [ɪ] in Guébie account for the reduced number of pronoun vowels [3: ε, a, ʊ], compared to the full Guébie vowel inventory [10, above]. As this is secondary to the point of this section, I leave these constraints out of the tableau below.

Ranked as in (24), the above constraints lead to the correct output of a [[Noun] Pronoun] structure, where both the noun and the pronoun are overt. These constraints ensure that the pronoun agrees phonologically with the final vowel of the noun in question.

- (24) **Ranking:** IDENT-OO, ANCHOR-R, IDENT-IO, REALIZEMORPH  $\gg$  DEP-FEATURE

For those cases where a pronoun surfaces without an overt noun I posit that the noun is present in the syntax but is elided at PF, [sukulu  $\upsilon$ ], 'it (school)' (cf. Merchant, 2001; Lasnik, 2007). Constituents that can optionally be elided are marked with a feature E in the syntax (Merchant, 2001), and here I propose a model of ellipsis where the phonology

<sup>6</sup>Note here that I am not treating feature *changes* such as input /u/ surfacing as [ε] to involve feature epenthesis (i.e. a violation of DEP-FEATURE. Instead, I consider feature changing to be violation of input-output identity. This choice is not crucial for the overall analysis.

has access to the E feature of the noun, just as it has access to other morphosyntactic features, such as the N feature triggering phonological agreement. The option of eliding the noun is then determined via constraints.

The presence of an E feature triggers what I call here an *ellipsis paradigm*. This paradigm involves the entire spell-out domain being evaluated, both where ellipsis has occurred, and where it has not. Both cells of the paradigm are evaluated simultaneously by the relevant cophonology.

The novel constraint in (25) is an output-output paradigm correspondence constraint (Burzio, 1994; Benua, 1997; Kager et al., 1999; McCarthy, 2005), which ensures that the phrase (or syntactic phase) containing the elided element is as similar to the optimal non-elided output as possible. For example, the elided form [sukulu̯] must be faithful to the non-elided [sukulu̯].

(25) **Faith-NoElide**

For each form in an ellipsis paradigm, assign one violation for each output segment whose features differ from corresponding output segments across the paradigm.

In an output-output paradigm correspondence model such as this, candidates consist of paradigms, which are evaluated together as a unit. In (??) there are both input-output correspondence relationships, as well as output-output paradigmatic correspondence relationships. We see that in Guébie, when DPs containing elided and non-elided nouns are evaluated together in a paradigm, the undominated constraint in (25) together with those constraints in (24) gives the correct output. That agreement can be sensitive to unpronounced material is well known (Merchant, 2015, 16), and the proposed constraints show an articulated model of this particular phenomenon.

{sukulu:N,E} {V{-ATR}:N}	FAITH-NOE	Id-IO	Id-OO	ANCHOR	REALIZE	DEP
a. sukulu̯, ̯					*	2
b. sukulu̯, ∅					**!	1
c. sukulu s, s̯				*!	*	3
d. sukulu̯, ε			*!		*	2
e. sukule̯, ε		*!			*	2
f. sukulu̯, ε	*!				*	2

Table 18: A constraint-based approach to ellipsis

Every form in (18) receives at least one REALIZEMORPH violation because the noun /sukulu<sup>1.1.3</sup>/ is unrealized in the second form of the paradigm.

The proposed analysis forces phonological agreement and provides the option of ellipsis at PF simultaneously via constraints (with regards to the latter, this analysis is similar to Bennett et al. (2015)’s analysis of Irish ellipsis at PF). A terminal node which has a morphosyntactic E features, available to the phonology, can optionally be elided via an ellipsis paradigm at PF, as in (18).

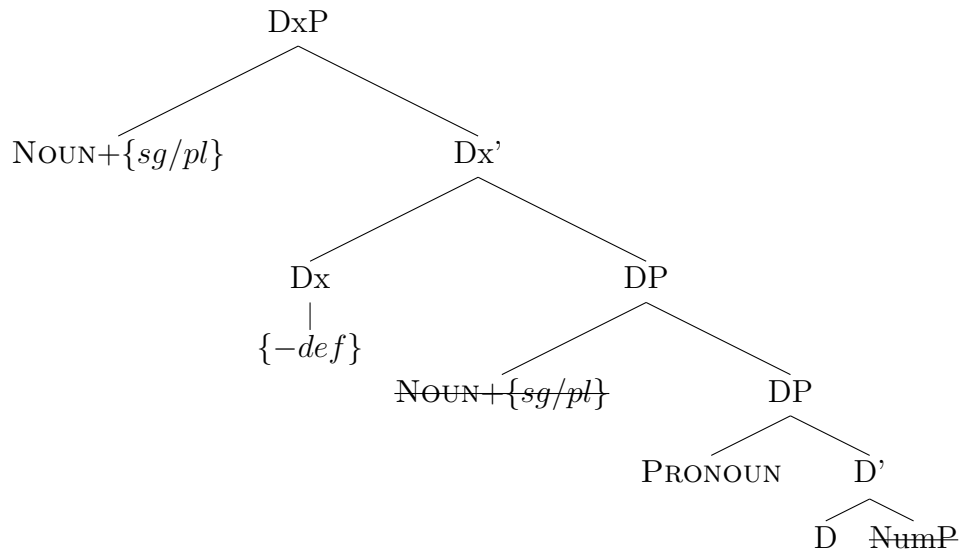
By evaluating paradigms of elided and non-elided candidates in Cophonology Theory, we predict phonological agreement of elements within a DP that agree in some morphosyntactic feature. Further predictions of the proposed model are discussed in section 4.

The resulting model is as shown in (26), where the noun with an E feature is present in the syntax along with the pronoun head. An AGR-node is inserted on the pronoun

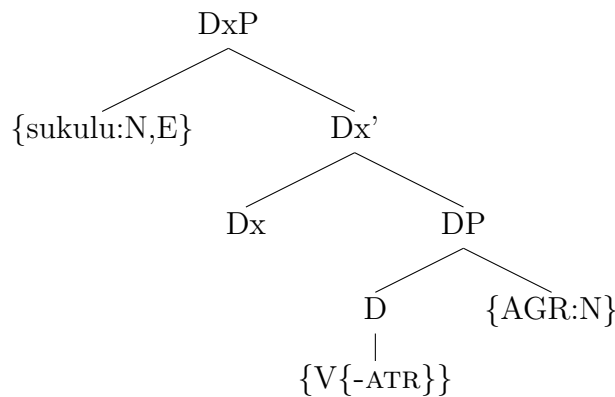
head during morphology, and linearization takes place. The phonology has access to the linearized terminal nodes and their features, and it ensures phonological identity between nodes that agree morphosyntactically. Optionally, a noun with an E-feature is elided, but the noun phrase with an elided noun must be as similar to the non-ellipsis member of the paradigm as possible, resulting in agreement between noun and pronoun, even when the noun is not pronounced.

(26) **An interface model of Guébie pronoun DP agreement**

a. **The syntax**



b. **The morphology**



c. **The phonology**



## 4 Typological predictions

The constraints presented in section 3.2.3, together with the proposed syntactic and morphological structure of the DP, account for phonological agreement between nouns and pronouns in Guébie. The same analysis explains the phonological agreement in nominative, accusative, emphatic, and possessive pronouns in Guébie; all involve a pronoun head with an optionally elided noun in the same DP. We will see that the proposed analysis

not only also accounts for the human pronouns and noun/adjective agreement in Guébie, but it also accurately predicts the types of existing phonologically determined agreement systems cross-linguistically.

The analysis in section 3.2.1 relies on the assumption that DP is a syntactic phase, and that morphology and phonology apply cyclically by phase. It predicts that any two elements within the same syntactic phase could show phonological agreement, as long as those two elements share some morphosyntactic feature. For Guébie, it is only the DP-specific phonological grammar which ensures phonological agreement; however, the constraints in section 3 do not rule out phonologically determined subject or object agreement on a verb in some other language, as long as the agreement controlling element is spelled out within the same domain as the verb.

Additionally, due to the nature of correspondence and identity constraints, the phonologically corresponding segments in the morphosyntactically agreeing elements must be either edge-based or surface in some prominent position in a word. The ANCHOR-R constraint in Guébie ensures correspondence at the right-edge of the noun and pronouns. However, we could imagine a system where ANCHOR-L is at play instead, requiring that corresponding segments be anchored to the left edge of the agreeing elements.

Perhaps a more specific statement of the prediction above, only an edge-aligned or prominent segment (or, perhaps, suprasegment) can control phonological agreement. We saw in section 3.2.3 that IDENT-OO plus ANCHOR-R ensures that the final segment of two elements with {N} features are identical. This means that in Guébie, the final vowel of the noun will control agreement. Rather than a final vowel, we could imagine a system where the agreement controlling segment is a consonant or is suprasegment.

The above predictions are summarized in (27).

(27) **Predictions of the model**

- A. Only elements within the same syntactic phase can surface in phonological agreement.
- B. Phonologically corresponding segments will be edge-based or surface within some prominent position in a word.
- C. Any edge-aligned or prominent segment or suprasegment can control agreement.

In section 4.1 I show that the model holds for human pronouns and in section 4.2 for noun/adjective agreement in Guébie. In sections 25-4.5 I turn to other attested phonologically determined agreement systems cross-linguistically. Very few languages outside of Kru have been described as having such systems; however, in those languages, we see the above predictions born out.

## 4.1 Guébie human pronouns

Recall that human pronouns in Guébie do not follow the phonological agreement pattern that all other nouns follow. Instead, they predictably take the forms /ɔ/, singular, and /wa/, plural. I repeat the pronoun chart for Guébie from (2) in (19) below.



	Human			Non-human	
	Singular	Plural		Singular	Plural
1st	e <sup>4</sup>	a <sup>3</sup>	1st	–	–
2nd	e <sup>2</sup>	a <sup>2</sup>	2nd	–	–
3rd	ɔ <sup>3</sup>	wa <sup>3</sup>	3rd	ɛ <sup>3</sup> , a <sup>3</sup> , ʊ <sup>3</sup>	ɪ <sup>3</sup> , wa <sup>3</sup>

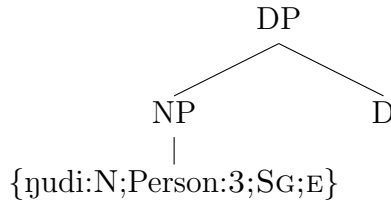
Table 19: Human and non-human subject pronouns

The model described in section (3) extends to human pronouns in Guébie without modification. We saw that nouns are present in the syntax in the same DP as pronouns, and their features are copied to the pronoun via a morphological AGR node. I claim here that human nouns not only have a [NOUN] feature which is copied to the pronoun, they also have a [PERSON] feature (Richards, 2008; Van der Wal, 2015). This is summarized in (20) and exemplified for *ɲudi*<sup>3.1</sup> ‘man’ in (28).

	Human	Nonhuman
Features	[+PERSON, N, E]	[-PERSON, N, E]
Vocabulary Item	/ɔ, wa/	/V{-ATR}/
Surface forms	[ɔ, wa]	[ɛ, a, ʊ, ɪ, wa]
	semantically determined	phonologically determined

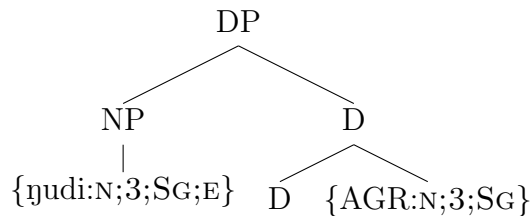
Table 20: Pronoun features and realization

(28) Syntactic representation of human pronouns



When features are copied from a human noun to the AGR node on the pronoun D, [PERSON] and [NUMBER] features are copied along with the [NOUN] feature. These are absent on non-human nouns.

(29) Morphological agreement between human nouns and pronouns



Then, during Vocabulary Insertion, this particular bundle of features is spelled out as [ɔ], as in (19). That is, the 3rd singular human vocabulary item /ɔ/ is inserted in the context of the features [+Person:3SG N]. Similarly, the plural human pronoun [wa] is inserted in the context of the features [+Person:3PL N]. This differs from all non-human nouns which are not marked for person or number features in the syntax.

(30) **Phonological representation of human pronouns**



We see that if certain semantic features of the noun (person, number) are copied to the pronoun D via morphological agreement mechanisms and spelled out by a vocabulary item with specified phonological features ( $[\text{N}, \text{PERS}:\mathbf{3}\text{SG}] \rightarrow [\text{ɔ}]$ ), that vocabulary item is not subject to phonological identity. Instead, a highly ranked constraint ensures faithfulness to the phonological content inserted during Vocabulary Insertion. This IDENT-IO constraint must be ranked higher than the IDENT-OO constraints requiring phonological agreement between agreeing elements in the DP, providing evidence for a more nuanced constraint ranking than the one presented in (24). We could imagine, then, a language with the same constraints but where input-output faithfulness was low-ranked, where the entire pronoun system would be phonologically determined, including first and second persons. As far as I know, no such language has been described, but the system proposed here predicts that it could exist.

Phonological identity between the pronoun and agreement-controlling noun seems to be a last resort agreement strategy in Guébie. Specifically, phonological identity holds only in those cases where there is no relevant vocabulary item with specified phonological content to insert. This prediction is supported by Corbett (1991)’s generalization that when semantic and phonological criteria for determining noun class are at odds, semantic features take precedence.

## 4.2 Guébie adjectives

Adjectives in Guébie agree in final vowel with the noun that they modify.

a. $\text{bit}\underline{\text{ɔ}}^{2.3} \text{lel}\underline{\text{ɔ}}^{2.3} \text{jɛl}\underline{\text{a}}^{1.1}$	b. $\text{fu}^3 \text{lel}\underline{\text{ɔ}}^{2.3} \text{jɛl}\underline{\text{ɔ}}^{1.1}$
house new red	sponge new red
‘A new red house’	‘A new red sponge’

Table 21: Noun-modifier phonological agreement (repeated from 12) (syl\_20151117)

We can derive this agreement in the same way as noun-pronoun agreement. Syntactically, nouns, along with the adjectives that directly modify them, are present in a single syntactic phase (DP). An AGR node is inserted on the adjective by the morphology. Features of the noun (namely, N) are copied to the adjective so that the adjective and noun are in morphosyntactic agreement. The phonology ensures that agreeing heads (the noun and its adjectival modifiers) are phonologically similar, via the same constraints discussed in section 3.

Further evidence that noun/adjective agreement works the same way as noun/pronoun agreement comes from ellipsis. In the same way that pronouns license ellipsis of the agreement-triggering noun (15b,c), adjectives that agree with the head noun license ellipsis of that noun, (22).

<p>a. lele<sup>2.3</sup> jɛla<sup>1.1</sup>          new red          ‘A new red one’ (house)</p>	<p>b. lelo<sup>2.3</sup> jɛlo<sup>1.1</sup>          new red          ‘A new red one’ (sponge)</p>
-----------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------

Table 22: Overt agreement on adjectives licenses ellipsis of the noun (syl.20151117)

Just like optional nominal ellipsis in [[Noun] Pronoun] constructions, [Noun [Adjective]] candidates are evaluated in paradigms, with two forms in each paradigm: one where the noun is elided and one where it is overt. A FAITH-NOELIDE constraint ensures output-output paradigm faithfulness so that the adjective agrees phonologically with the noun even when the noun is elided. The relevant constraint ranking is identical to the one shown for noun/pronoun agreement in in (??).

Though they are few, other languages have also been described to have phonologically determined agreement systems. These include other Kru languages, Bainuk (Atlantic) (Sauvageot, 1967), Abu’ (Arapesh) (Nekitel, 1986), Bóná (Adamawa) (Van de Velde and Idiatov, 2017), and Fròʔò (Gur) (Traoré and Féry, 2017). Like Guébie, phonological agreement in each of these other languages is productive, predictable, and not strictly local. Three of these systems are examined in the remainder of this section.

### 4.3 Other Kru languages

A similar phonologically determined agreement system to Guébie is present in other Kru languages. These include but are not limited to Krahn, a Western Kru language (Bing, 1987); Godié, an Eastern Kru language (Marchese, 1986b, 1988); and Vata, an Eastern Kru language (Kaye, 1981; Marchese, 1979; Corbett, 1991).

#### 4.3.1 Krahn

Bing (1987) describes an agreement pattern in Gbɔbo, a dialect of Krahn (Western Kru) spoken in Liberia and Côte d’Ivoire, that is quite similar to the Guébie pattern. There are nine vowels in the Krahn system, and there are four possible third-person singular pronouns vowels: one for humans and three phonologically determined ones for non-humans. Non-human nouns that end in front vowels take the front vowel pronoun  $\epsilon$ , those that end in non-high back vowels take the pronoun vowel  $\text{ɔ}$ , and those that end in high back vowels take the pronoun vowel  $\text{ʊ}$ .

Noun	Gloss	Pronoun
jɪ	‘leopard’	$\epsilon$
ni	‘water’	$\epsilon$
kasee	‘cassette’	$\epsilon$
gba	‘dam’	$\text{ɔ}$
sɔɔ	‘basket’	$\text{ɔ}$
pu	‘gun’	$\text{ʊ}$
tau	‘basket’	$\text{ʊ}$
dʊ	‘honey’	$\text{ʊ}$

Table 23: Krahn phonological agreement

Since the Krahn system is so similar to the Guébie one, it requires no extra theoretical tools to account for the data. The proposed model would apply to Krahn just as it

does to Guébie, ensuring phonological agreement between the final vowel of the noun and pronoun unless the noun is human, in which case the semantic features win out. The only significant difference is that Bing does not mention any category of element other than pronouns that agrees with the noun in Krahn. If adjectives do not agree phonologically with the nouns they modify, we can assume that adjectives in Krahn do not agree *morphologically* in features with nouns; thus, no phonological identity is required to hold between them.

### 4.3.2 Godié

Godié is an Eastern Kru language spoken in Côte d’Ivoire. Just like Guébie and Krahn, there are four possible pronoun vowels in Godié: one human vowel and three phonologically determined vowels. However, Godié agreement processes target not only pronouns, but also definite clitics, demonstratives, and adjectives (Marchese, 1986b, 1988).

In the Godié example below, the human word ‘man’ triggers the agreement vowel [ɔ] on the adjective and demonstrative following it. The final front vowel of the word ‘animal’ triggers the front agreement vowel [ɛ] on the adjective [kəd-ɛ] that describes the word ‘animal.’

(31) **Godié pronoun agreement**

ɲɔkpɔ̄ kəd-ɔ̄ nɔ̄ nii mlɛ̄ kəd-ɛ̄  
 man big this saw animal big  
 ‘This big man saw the big animal.’

Since demonstratives, definite clitics, pronouns, and adjectives are all within the DP domain, all of them should be equally likely to agree with the noun. I have proposed that the phonology applies by phase, and that DP is a phase, so the phonological analysis applies to any two elements within a DP phase as long as they are in morphosyntactic agreement. Thus, the difference between the Godié agreement system and the Guébie system is that in Godié demonstratives and definite markers are in morphosyntactic agreement with the noun, while in Guébie they are not. Guébie lacks demonstratives entirely but has a definite clitic /=*a*/ which surfaces on the noun. Further research is needed to determine whether there are any true syntactic differences between Guébie and Godié definite markers which shows that they are in agreement with the noun in Godié but not Guébie. What matters for this analysis, though, is that demonstratives and definite markers in Godié agree *morphologically* with the head noun.

### 4.3.3 Vata

Vata is an Eastern Kru language spoken in south-central Côte d’Ivoire (Kaye, 1981). The Vata system differs slightly from the phonological agreement systems of other Kru languages discussed thus far. There are ten contrastive vowels in Vata, at five places of articulation with an ATR contrast, /i, ɪ, e, ɛ, u, ʊ, o, ɔ, ə, a/. Rather than three possible non-human pronoun vowels like Guébie, Krahn, and Godié, Vata has five non-human pronoun vowels: one for each of the five degrees of height and backness /i, ɛ, ʊ, ɔ, a/.

Agreement holds between a noun and a personal pronoun in Vata, as well as between a noun and a relative pronoun, as shown in (24).

Nouns	Glosses	Pronoun-be.big	Relative Pronoun
li, di	‘songs, villages’	i-ɣli	mɪɪ
cɪcɛ, ɓle	‘eagle, cow’	ɛ-ɣli	mɛmɛ
ɔlɪɪ, du	‘progue, village’	u-ɣli	mɪɪɪ
lagɔ, deto	‘god, spider’	ɔ-ɣli	mɔmɔ
ɟla, slə	‘lion, home’	a-ɣli	mama

Table 24: Pronouns in Vata

I have chosen one noun ending in a +ATR and one ending in a -ATR vowel for each of the five height/backness distinctions in (24). The pronoun and relative pronoun themselves remain -ATR even when the noun ends in a +ATR value. Only the backness, height, and rounding of the vowel is determined by the final vowel of the noun.

We can extend the analysis from section 3 to Vata agreement with little change. We only need to rerank certain constraints to get the right output. In Guébie, there is a ten-vowel system in the language which is reduced to three possible agreeing vowels for non-human pronouns. I mentioned in section 3 that in order to account for the reduced number of possible pronoun vowels in Guébie, [ɛ, a, ʊ] as opposed to the full ten [i, ɪ, e, ɛ, ə, a, u, ʊ, o, ɔ], we would need constraints like PERIPHERALVOWEL which prefers the peripheral -ATR vowels /ɪ, a, ʊ/, and \*I to prefer /ɛ/ over /ɪ/. In Guébie these constraints must be highly ranked, only crucially out-ranked by IDENT-IO. However, in Vata, the same constraints must be very low-ranked, because they play no role in the Vata agreement system. In Vata, for every distinct final vowel on nouns, there is a corresponding pronoun vowel that has the same height, backness, and rounding features. Only the ATR features of the pronoun are pre-specified on the pronoun vowel in Vata. Thus, by simply ensuring that IDENT-OO outranks PERIPHERALVOWEL and other such vowel markendess constraints, we get the correct output for Vata without otherwise changing the analysis for Guébie presented in section 3.

It is worth noting that the kind of minor typological variation we see between Guébie and Vata is predicted by a constraint-based analysis like the one presented here, but is less obviously expected in a rule-based phonology or a purely syntactic approach to phonologically determined agreement.

#### 4.3.4 Summary of Kru phonological agreement

Krahn and Godié, like Guébie, have three possible forms for non-human third-person singular pronouns. The optimal form is the one that agrees with the noun phonologically. In Vata, there are five possible vowels for non-human third-person singular pronouns, where height and backness, as opposed to just backness of the pronoun vowel is determined by the final vowel of the noun.

	Guébie	Krahn	Godié	Vata
Number of Agreeing Vowels	3	3	3	5
(Non-human) Pronoun-Noun	Yes	Yes	Yes	Yes
Possessive-Noun	Yes	Yes	Yes	Yes
Adjective-Noun	Yes	No	Yes	No
Demonstrative-Noun	N/A	No	Yes	No
Definite-Noun	No	No	Yes	No
Relative Pronoun-Noun	No	No	No	Yes

Table 25: Phonological agreement across Kru

The phonologically determined agreement systems in Krahn, Godié, and Vata all closely resemble the Guébie system except that a different set of elements agrees with the noun in each language. However, because all of the agreeing elements occur within the DP phase, each system above is predicted by the proposed analysis (cf. Prediction A in 27).

#### 4.4 Bainuk

Bainuk, a Western Atlantic language spoken in Senegal and Guinea (Sauvageot, 1967), also shows phonological agreement within DPs. Most nouns in Bainuk take one of 18 fixed noun class prefixes; however, there is a class of prefixless nouns that triggers phonologically determined agreement. Prefixed nouns are much like human pronouns in Guébie, where semantic feature bundles determine the agreement marker (26, 32)). Agreement classes of prefixless nouns in Bainuk can be derived phonologically in the same way as the phonologically determined non-human pronouns (27).

Singular	Plural	Gloss
si-nɔx	mu-nɔχ	‘tree’
si-de:n	mu-de:n	‘pirogue’
gu-sɔl	ha-sɔl	‘tunic’
bu-sumɔl	i-sumɔl	‘snake’
bu-domel	i-domel	‘papaya’

Table 26: Bainuk prefixed nouns

Demonstratives (32a), numbers (32b), interrogatives (32c), pronouns (32d-e), and adjectives (32f) agree in noun class with the prefixing nouns. Prefixed nouns are marked for plural number by changing the noun class prefix.

#### (32) Prefixed noun agreement

- a. si-de:n-o in-si  
pirogue this  
‘this pirogue’
- b. mu-de:n mu-nak  
pirogues two  
‘two pirogues’

- c. si-nɔx se-rã  
tree which  
'which tree?'
- d. in-si  
this-one  
'this one (pirogue)'
- e. uɲ-gu  
this-one  
'this one (tunic)'
- f. si-de:n si-wuri  
pirogue long  
'long pirogue'

Prefixless nouns do not have a noun-class prefix to trigger agreement on the following modifiers. Because there is no prefix, there is no affect of plurality on prefixes for these nouns. Instead, there is a change in final vowel that makes a prefixless noun plural (Sauvageot, 1987, 18). Though there is no noun class prefix for this group of nouns, the first syllable, no matter its shape, surfaces as the agreement marker on demonstratives, numerals, Wh-words, adjectives, and pronouns.

<p>a. <b>kata</b>:ma-ã    <u>ka</u>-nak-ã river            two 'two rivers'</p>	<p>b. <b>dap</b>ɔn            <u>da</u>-wuri grass                long 'long grass'</p>
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Table 27: Bainuk prefixless noun agreement

The possible number of agreement prefixes is extremely high in Bainuk, not limited to three possible vowels as in Guébie, but rather determined by the number of distinct first syllables in prefixless nouns. However, only a small set of nouns trigger such agreement in Bainuk, unlike Guébie where all non-human nouns require phonologically determine agreement.

Note that in Bainuk, phonological correspondence is anchored to the left edge of the agreement-controlling noun and the agreeing elements. Though this is distinct from Guébie right-edge vowel agreement, it is predicted by the proposed analysis (cf. Prediction B in 27).

## 4.5 Abu'

Abu', also spelled Abuq, a dialect of Arapesh spoken in Papua New Guinea (Nekitel, 1986), also shows phonologically determined agreement. Here, the final consonant of a noun triggers phonological agreement on demonstratives, adjectives, and verbs (Aronoff, 1992; Dobrin, 1995)<sup>7</sup>.

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<sup>7</sup>See Aronoff (1992) for an analysis of the difference between noun class agreement within a noun phrase and agreement between a noun and a verb, with specific reference to the Arapesh data.

(33) **Abu' phonological agreement** (Nekitel (1986) cited in Dobrin (1995))

- a. aleman afu-**n**-eri            **n**-ahe'  
man    good-CLN-ADJ CLN-went  
'a good man went'
- b. almil afu-**l**-i                **l**-ahe'  
bird    good-CLL-ADJ CLL-went  
'a good bird went.'
- c. ihiaburuh afu-**h**-i            **h**-ahe'  
butterfly good-CLH-ADJ CLL-went  
'a good butterfly went.'

Traditionally there are 13 possible final consonants in Abu'. Since contact with Tok Pisin and other languages, words have been borrowed with other final consonants. Even in borrowed words with non-native segments, like /r, p/ in (34a,b), the final consonant of the noun triggers agreement, thus this is clearly a phonologically-determined system.

(34) **Borrowed words undergo phonological agreement**

- a. pater ara  
priest this  
'This priest'
- b. paip apa  
pipe this  
'This pipe'

In Abu' it is right-aligned *consonants*, rather than vowels (Guébie) or syllables (Bainuk) that trigger agreement. The analysis proposed in section 3 predicts such a system (cf. Prediction C in 27).

## 5 Discussion

We have seen that an interface approach to phonologically determined agreement accounts for the Guébie data as well as for a range of cross-linguistic phonologically determined agreement data.

Noun class agreement for a subset of the lexicon of each of the languages discussed here, Guébie and other Kru languages, Bainuk, and Abu', is purely phonologically determined. However, in each of these languages, there is part of the lexicon for which semantic features are also necessary to determine the agreement markers. There is no attested noun class or gender system, to my knowledge, that is entirely phonologically determined (Corbett, 1991). In Guébie, for example, all human nouns have specified pronoun forms irrelevant of the phonological form of the noun; though, for all non-human nouns, phonological form is the determining factor.

While Guébie nominal concord is not quite entirely phonologically determined, the analysis in section 3 does not rule out the possibility of a purely phonologically determined system. The analysis requires that any vocabulary item whose insertion criteria are met given the syntactic input to morphology be inserted during the morphological component, leaving the phonology to take care of the rest. In this way, the proposed



model predicts exactly the generalization by Corbett (1991) that when semantic and phonological features determining noun class are at odds, the semantics will win out. Vocabulary items inserted in the context of particular semantic features will be unaffected by phonological agreement, while those underspecified for insertion context (and underspecified for phonological feature content) are predicted to show phonologically determined agreement.

Given this analysis, we could imagine a language where no set of semantic person, number, and gender features is spelled out by a particular vocabulary item during the morphological vocabulary insertion operation. This would leave the phonology to determine the output of all phonologically underspecified agreeing heads.

The fact that we do not find an entirely phonologically determined system is unsurprising from a functionalist perspective. As Corbett (1991) notes, the most common noun class distinctions are human versus non-human, animate versus inanimate, and masculine versus feminine. All of these features are prominent ones in daily human interaction, and it is not surprising that many grammars distinguish between these semantic categories for ease of communication. While from the perspective of a formal grammatical model, the analysis in section 3 predicts the existence of a purely phonologically determined system, the functional load of distinguishing between, say, human and non-human referents is too important for a grammar to ignore.

While phonological features are not predicted to influence morphosyntactic processes like agreement (Pullum and Zwicky, 1986, 1988), agreement within a noun phrase is often determined, at least partially, by phonological features. The question raised here, then, is whether phonologically determined agreement systems can be modeled without violating the assumption that syntax is phonology-free. Crucially, the analysis proposed in section 3 does not require us to say that phonological information is present in the syntax, or that syntax is sensitive to phonological information in any way. Instead, agreement within the noun phrase is a morphological operation resulting in two or more syntactic heads that share morphosyntactic features. Phonological constraints, which are active only after the syntactic and morphological components of grammar, have access to morphosyntactic features of heads and ensure phonological identity between agreeing elements. In this way, the proposed analysis does not question the assumption of a phonology-free syntax.

One may wonder, however, whether the given analysis requires more stipulation or makes different predictions than an analysis which allows phonological information to be present in the syntax, before morphosyntactic agreement takes place. Answering this question requires more data and perhaps psycholinguistic experimentation. That is, in order to retract the assumption that syntax is phonology free, we as a field will want more evidence than just a single phenomenon like phonologically determined agreement. Anttila (2016) provides a review of work on prosodic size restrictions on syntax, where to some statistically significant extent (Bresnan et al., 2007), word order seems to be conditioned by phonological factors. He shows that with a view of phonological filters on possible syntactic structures (Anttila, 2008; Anttila et al., 2010), we need not say that phonological information is present during the syntactic component. Other recent work has also claimed that there is a closer relationship between phonology and syntax than previously thought, and that syntactic structure must be able to reference at least prosody (McFadden and Sundaresan, 2015; Richards, 2016, 2017a,b,c).

In the analysis in section 3 we saw that apparent phonologically determined agreement can be analyzed without needing syntax to be sensitive to phonology. In Anttila (2016) and prior work, phonologically conditioned word orders are analyzed with a phonology-

free syntax as well. We can ask the question, if not word order or agreement data, what kind of data would convince us that syntax is sensitive to phonological information? While I cannot provide an answer to this question here, I encourage that we as a field revisit the assumption of phonology-free syntax.

## 6 Conclusion

This paper provides an initial description of the phonologically determined agreement system of Guébie (Kru, Niger-Congo), and proposes an interface-based analysis where phonologically determined nominal concord arises through phonological identity to output forms via morphological agreement mechanisms. In addition to accounting for phonologically determined agreement, the proposed analysis includes a formal account of ellipsis via constraints at PF.

I have shown that the proposed analysis accounts for the variation in attested cross-linguistic phonologically determined agreement systems, though I leave as a question for further research whether it could serve as a model of gender and noun class systems more generally.

Crucially, this paper demonstrates that phonologically determined agreement systems can be modeled without requiring phonological features to be present in syntax. Thus *we can maintain that syntax is not sensitive to phonological features*. I raise another question in its place: Given the existence of partially phonologically determined agreement systems like the one in Guébie, what is the real benefit in maintaining that syntax is phonology-free?

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