

# SYNCRETISM IN SHIWILU: ALLOMORPHY AND IMPOVERISHMENT<sup>♥</sup>

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**1 INTRODUCTION.** In this paper, I decompose nine verbal suffix paradigms in Shiwilu that encode tense, aspect or mood (henceforth TAM), person and number information. The decomposition of these paradigm forms unearths a number of issues relevant to current morphological theory, and specifically to Distributed Morphology (Halle & Marantz 1993, 1994, Harley & Noyer 1999 for a summary of the motivation and assumptions of Distributed Morphology). I present a step-by-step analysis of the Shiwilu data within the framework of Distributed Morphology (henceforth DM). Then, I show how the Subset Principle, Impoverishment with feature copy and feature geometric representations of morphosyntactic features determine Vocabulary Insertion.

Shiwilu is an endangered and understudied language of the Cahuapanan family spoken in the Amazon basin of Peru in the state of Loreto. Shiwilu (also called Jebero) has not been studied since the dissertation work of Bendor-Samuel (1958) and is a fascinating language because it has three typologically unusual properties: (1) OVS word order, (2) a first person inclusive singular pronoun and (3) an unusually articulated dental lateral segment in its phoneme inventory.

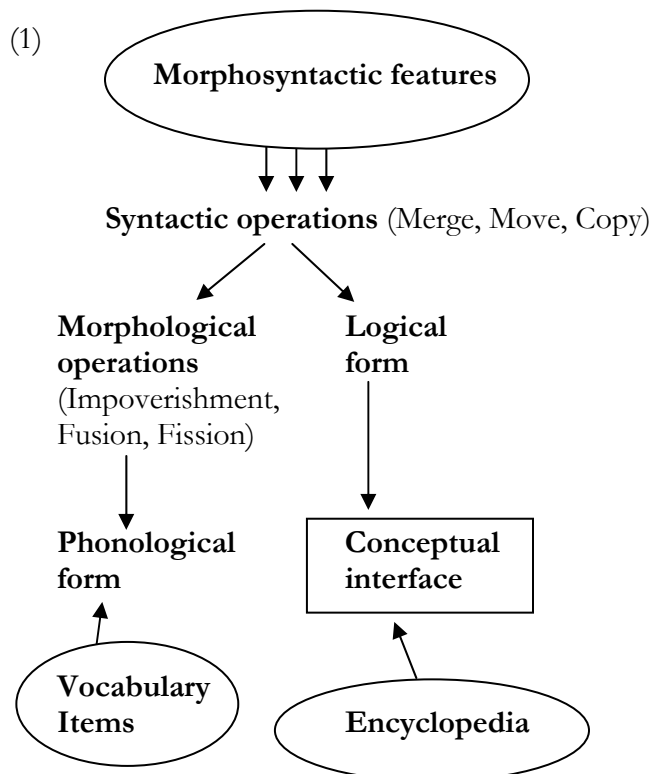
First, in Section 2, I present the central tenets of Distributed Morphology focusing on the way in which DM employs underspecification along with the operation of Impoverishment to deal with syncretism and metasycretism with an example that compares Russian and Spanish. Then, in

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Section 3, I provide a background on feature geometric representations of morphosyntactic features, including TAM features as well as person and number features (Harley & Ritter 2002), that will prove relevant to the analysis. In Section 4, I lay out instances of morphophonological allomorphy and morphosyntactic allomorphy in the Shiwilu paradigms. Finally, in Section 5, I show how Vocabulary Insertion is determined by the Subset Principle, Impoverishment, feature copy and the feature geometries.

**2 DISTRIBUTED MORPHOLOGY.** Central to the theory of Distributed Morphology is the idea that morphological operations are “distributed” throughout separate components of the grammar. Morphemes are construed as Vocabulary Items (or phonological strings) that are inserted after syntactic and morphological operations to match feature bundles set up by the syntax and manipulated by the morphology. The architecture of the grammar in DM is shown in (1) below.



Three properties are at the core of DM: LATE INSERTION, UNDERSPECIFICATION and SYNTACTIC HIERARCHICAL STRUCTURE ALL THE WAY DOWN. LATE INSERTION implies that Vocabulary Items are inserted into syntactic terminal nodes after syntax. UNDERSPECIFICATION entails that Vocabulary Items do not need to be specified for all syntactic features. SYNTACTIC HIERARCHICAL STRUCTURE ALL THE WAY DOWN engenders even treatment of syntactic and morphological elements. The next section expounds on the details behind the realizational nature of DM by using some simple and illustrative examples of syncretism and metasyncretism in Spanish and Russian.

**2.1 SYNCRETISM AND METASYNCRETISM IN DM.** Descriptively, when two or more forms or cells of a paradigm are the same, we have a case of syncretism. Syncretism defined in terms Distributed Morphology, is when a VOCABULARY ITEM (a phonological expression inserted after syntax) realizes more than one bundle of features in a terminal node of the syntax.<sup>1</sup> In a paradigm without syncretism, a one-to-one correspondence exists between the features of a Vocabulary Item (henceforth VI) and the features of a syntactic terminal node, but this is not always the case in natural language. To illustrate, a simplified comparison of a subset of paradigm structures in Spanish and Russian shows the difference between a one-to-one and a one-to-many correspondence that may exist between a feature bundle and a syntactic terminal node. The one-to-one, non-syncretic case is represented by Spanish and the many-to-one, syncretic case is represented by Russian. The Spanish paradigm for the present tense conjugation of the verb *caminar* ‘walk’ is presented in Table 1.

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<sup>1</sup> See Bobaljik (2002) for arguments for a DM style analysis as preferable to claiming that metasyncretism is a result of paradigm structures as a primitive of the grammar, as has been argued, most directly by Williams (1994). Paradigm structures are also central in theories of morphology such as Paradigm Function Morphology (Stump 2001).

Table 1: Present tense conjugation of Spanish verb *caminar* ‘walk’

Person	Singular	Plural
1	camino	caminamos
2	caminas	caminais
3	camina	caminan

The morphemes, or VIs, that spell out the person and number bundles for the Spanish paradigm in Table 1 are listed in (2) with the VI on the left and its features on the right.

- (2) VIs for Spanish paradigm
- a. -o           ↔ first person, singular
  - b. -as          ↔ second person, singular
  - c. -a           ↔ third person, singular
  - d. -amos       ↔ first person, plural
  - e. -ais          ↔ second person, plural
  - f. -an          ↔ third person plural

The one-to-one paradigm in Table 1 recurs in Spanish. Table 2 shows that the one-to-one pattern is also present in the past preterit conjugation.

Table 2: Spanish preterit past conjugation of Spanish verb *caminar* ‘walk’

Person	Singular	Plural
1	caminé	caminamos
2	caminaste	caminasteis
3	camino <sup>2</sup>	caminaron

Despite the paradigm in Table 2 having different VIs, the pattern is the same. Thus, there is a recurrent paradigm structure, or a metaparadigm in Spanish. This can be illustrated by the division of cells in Table 3 with the letters A through F abstracting away from the particular VIs and showing the pattern that recurs across paradigms.<sup>3</sup>

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<sup>2</sup> This forms looks phonologically similar to the first person singular present tense form *camino*., but there is a difference in stress placement which shows the third person singular preterit to be non-syncretic with the first person singular present form.

<sup>3</sup> This is a simplified example. There are other paradigms in Spanish that show syncretism, specifically with first and third person forms syncretizing. Overall, paradigms and syncretism constitute complex and unsolved problems in morphology.

Table 3: Spanish meta-paradigm

Person	Singular	Plural
1	A	D
2	B	E
3	C	F

In contrast to the Spanish one-to-one pattern, a one-to-many pattern emerges in the plural conjugation of third person forms in Russian.<sup>4</sup> Table 4 shows syncretism across masculine, feminine and neuter gender in the plural cells of the paradigm. This syncretism is shown by the grey shading of the cells involving a plural feature.

Table 4: Past tense of the third person of the Russian verb ‘played’ (Baerman et al. 2005: 31)

Gender	Singular	Plural
Masc	igral	igrali
Fem	igrala	igrali
Neut	igralo	igrali

If we are only considering the case of syncretism in Table 4, an underspecification analysis can capture the relevant data. Assuming underspecification, the VI that spells out plural need not be specified for gender features at all, as in the VI in (3d).

- (3) VIs for Russian paradigm in Table 4
- a.  $\emptyset$        $\Leftrightarrow$  masculine, singular
  - b. -a         $\Leftrightarrow$  feminine, singular
  - c. -o         $\Leftrightarrow$  neuter, singular
  - d. -i         $\Leftrightarrow$  elsewhere

In the case of a recurrent pattern across paradigms that involves different VIs, metasyncretism is present. Table 5 shows the same pattern of syncretism with different VIs, shown in (4).

Table 5: Russian nominative adjectival endings (Bobaljik 2002: 10)

Gender	Singular	Plural
Masc	-yj	-ye
Fem	-aja	-ye
Neut	-oe	-ye

<sup>4</sup> This is a simplified example, showing only third person forms. In general, Russian gender syncretizes in the plural of third person (and third person only), and there are very complex pattern of syncretism in the language (Bobaljik 2002).

- (4) VIs for Russian nominative adjectival endings
- a. -yj        ⇔ masculine, singular
  - b. -aja      ⇔ feminine, singular
  - c. -oe       ⇔ neuter, singular
  - d. -ye       ⇔ elsewhere

In both Tables 4 and 5, there are four distinct VIs, but, most importantly, despite the different phonological strings across Tables 4 and 5, the pattern is the same: though a different VI spells out gender in the different paradigms, the relevant VI collapses gender in the plural in both paradigms.

Table 6 shows an abstract representation of the metasyncretism in the Russian example.

Table 6: Russian meta-paradigm

Gender	Singular	Plural
Masc	A	D
Fem	B	
Neut	C	

To capture the phenomenon of metasyncretism in Russian, Bobaljik (2002), like Frampton (2002), employs Impoverishment (Bonet 1991), a morphological operation that deletes a feature or features from a feature bundle from a syntactic terminal node. Impoverishment can be conceptualized as a ‘retreat to the general case’ because feature deletion removes the environment for a more specific VIs application (‘bleeding’ the specific VI) (Halle & Marantz 1994). Since Impoverishment takes place in the morphological component, it can manipulate feature bundles in the syntactic terminal nodes after the syntactic structure has been built up but before Vocabulary Insertion.

The metasyncretism in Russian can be captured by an Impoverishment rule that deletes the gender feature in the environment of plural, formalized in (5).

$$(5) \text{ [GENDER]} \rightarrow \emptyset / \_\_\text{[PLURAL]}$$

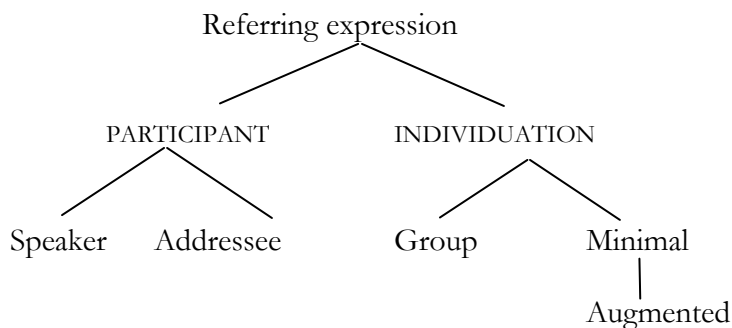
The purpose of this paper is to decompose the Shiwilu paradigms to reveal patterns of syncretism and metasyncretism that are not as transparent as these simplified examples from Spanish

and Russian. The next section introduces the idea of feature geometric representations for morphosyntactic features, akin to that of Harley & Ritter (2002).

**3 FEATURE GEOMETRIC REPRESENTATIONS.** The following two subsections will outline feature geometries for the representation of morphosyntactic features relevant to the Shiwilu data. A feature geometric representation of morphosyntactic features will prove to be particularly relevant to resolving VI competitions, specifically in Section 5.

**3.1 THE REPRESENTATION OF PERSON AND NUMBER FEATURES.** As Harley and Ritter (2002) show, a set of universal morphological features arranged in a hierarchy not only simplifies the representation of person and number features but also explains universal tendencies, restrictions and dependencies in paradigms across languages. One of their arguments for feature geometric representations is that they constrain the combinatorial possibilities of morphosyntactic features. The feature geometry in (6) represents the morphosyntactic features of person and number available for natural human languages provided by Universal Grammar.

(6) Person and number feature geometry (adapted from Harley & Ritter (2002))

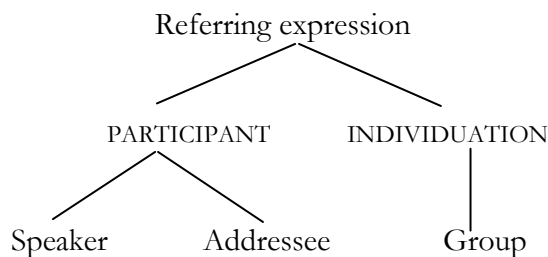


Not all features are active in all languages, as Harley and Ritter (2002) explain. More likely, just a few of these features will be active in a certain languages, depending upon the morphosyntactic contrasts that are relevant in that language. Shiwilu has a four person system with

first exclusive, first inclusive, second and third person forms. In a four person system, a first person inclusive form would be represented by the activation of the SPEAKER and the ADDRESSEE nodes of the higher PARTICIPANT node that represents person features. Additionally, for a language that has a singular~plural distinction, there will be one active feature of the INDIVIDUATION node, namely GROUP. In the absence of specification of the INDIVIDUATION node, singular is interpreted. For a language that has inclusives with the SPEAKER, ADDRESSEE, and GROUP nodes activated, the geometry does not specify whether the INDIVIDUATION node refers to the number of ADDRESSEES or the total number of participants. This is particularly relevant to languages that have a singular~dual~plural number distinction. If a language treats the first person inclusive with a singular phonological exponent, then the plural probably specifies the number of addressees rather than the total number of participants and vice versa.

In feature geometric terms, the active features in Shiwilu are {Speaker}, {Addressee} and {Group}, shown in (7).

(7) Active features in Shiwilu

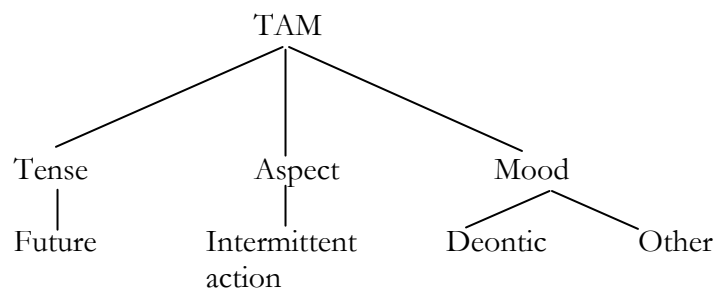


A first person inclusive can be expressed as the maximal specification of the PARTICIPANT node, with SPEAKER and ADDRESSEE activated. The active feature in the representation of the plural forms will be GROUP. Next, we turn to the representation of TAM features in Shiwilu.

**3.2 THE REPRESENTATION OF TAM FEATURES.** I propose that TAM features are also organized in a feature geometry, much like that of person and number features in Section 3.1. The

main argument for this type of representation is that the person VIs are conditioned by supercategories of TAM features, as will become clear in Section 4. These conditioning features do not necessarily refer to the most specific TAM feature, but sometimes to the higher node to which the specific TAM feature belongs. For example, the person VI is sensitive to the category [TENSE] rather than the specific nodes that the tense node dominates, such as NON-FUTURE. Similar proposals have been made for the representation of TAM features. A TAM feature geometry has been proposed by Cowper (2003) for English and Spanish. In Shiwilu, tense, aspect and mood are all relevant categories for the feature geometry in (8).

(8) TAM feature geometry for Shiwilu



The predictions that are made by the feature geometry in (8) are that tense, aspect and mood are separate, non-dependent categories. The features dependent upon them also have predictions that can be made about them. For example, for the tense node, future is the marked case, so in the absence of the future feature, non-future is the default interpretation. An additional benefit of feature geometric representations is that Impoverishment can be conceptualized as a delinking operation that results in a default reference to a higher featural category, such as TENSE as opposed to FUTURE. The morphosyntactic feature geometries will come into play in important ways in resolving VI competitions in Section 5.

4 **THE SHIWILU DATA.** The data include nine paradigms of verbal suffixes that encode person, number and TAM information. Two examples of these suffixes along with verbs are shown in (9) and (10) with the relevant suffix in bold.<sup>5</sup>

(9) tek<sup>ʔ</sup>ka-**ʌi**  
run-3.SG.NON.FUT  
'he ran' (Bendor-Samuel 1958: 19)

(10) wa<sup>ʔ</sup>teŋ-**pi<sup>ʔ</sup>nak<sup>ʔ</sup>ma**  
wait-2.SG.OBLIG  
'you should have waited' (Bendor-Samuel 1958: 107)

The decomposition of the Shiwilu paradigms is organized according to TAM category to reveal very interesting patterns of allomorphy based on TAM category. Shiwilu has two tenses: actual (non-future) and future (non-actual). There are three deontic modals that express permission or obligation to perform some action (Gamut 1991): desiderative, obligative and unfulfilled wish. There are two other modals that are not deontic: conditional and subjunctive. Two aspectual categories are active in Shiwilu: durative and intermittent action. The following tables show the complete paradigms I will be analyzing and include the set of independent pronouns in Shiwilu.

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<sup>5</sup> The symbol 'd' is used in the Shiwilu data here as an orthographic convention first used by Bendor-Samuel (1958) to represent a "frictionless continuant", similar to a lateral segment but articulated with the tongue tip in contact with the bottom teeth. For more information, see Bendor-Samuel (1958) as well as Olson (2006).

Table 7: Pronouns

Person	Singular	Plural
1 excl	kwa	kuda
1 incl	kwa-nta	kuda-nta
2	kuŋma	kuŋmama
3	nana	nawak

Table 8: Actual or non-future

Person	Singular	Plural
1 excl	-lək	-ɬidək
1 incl	-lək	-ləkwaʔ
2	-la	-lama
3	-ɬi	-ɬina

Table 9: Future or non-actual

Person	Singular	Plural
1 excl	-əcʔək	-əcidək
1 incl	-atər	-atərwaʔ
2	-əcu	-əcuma
3	-əcʔuŋ	-əcuna

Table 10: Unfulfilled wish mood

Person	Singular	Plural
1 excl	-aʔka	-aʔkudək
1 incl	-aʔka	-aʔkawaʔ
2	-aʔma	-aʔmamaʔ
3	-aʔa	-ərka

Table 11: Desiderative mood

Person	Singular	Plural
1 excl	-inaʔka	-inaʔʔudək
1 incl	-inaʔka	-inaʔkawaʔ
2	-inaʔma	-inaʔmamaʔ
3	-inaʔa	-inərka

Table 12: Obligative mood

Person	Singular	Plural
1 excl	-piʔnakʔ	-piʔnakʔkudək
1 incl	-piʔnakʔ	-piʔnakʔwaʔ
2	-piʔnakʔma	-piʔnakʔmamaʔ
3	-piʔnakʔ	-pinərəkək

Table 13: Conditional mood

Person	Singular	Plural
1 excl	-nansəku	-nansəkudək
1 incl	-nansuʔ	-nansuʔwaʔ
2	-nansiŋ	-nansiŋmaʔ
3	-suʔ	-nantasər

Table 14: Subjunctive mood

Person	Singular	Plural
1 excl	-atəku	-atəkudək
1 incl	-atək	-atəkwa
2	-aciŋ	-aciŋnaʔ
3	-aci	-acina

Table 15: Durative aspect

Person	Singular	Plural
1 excl	-aʔsəku	-aʔsəkudək
1 incl	-aʔsik	-aʔsikwaʔ
2	-aʔsiŋ	-aʔsiŋmaʔ
3	-sik	-aʔsər

Table 16: Intermittent action aspect

Person	Singular	Plural
1 excl	-səku	-səkudək
1 incl	-sik	-sikwaʔ
2	-siŋ	-siŋmaʔ
3	-suʔ	-aʔsər

Of the following sections, cases of phonological allomorphy are considered in 4.1. Then, the data is divided into subsection by person with singular and plural forms shown and TAM category highlighted in Section 4.2.

**4.1 PHONOLOGICAL CONDITIONS.** There are clearly a number of cases of phonologically conditioned allomorphy in the Shiwilu data. There is a case of phonological allomorphy conditioned by palatalization of the TAM exponent in the context of a following a high vowel, *i* or *u*. Tableau 1 shows the ranking of constraints in an Optimality Theoretic (Prince & Smolensky 1993) account of palatalization (Kiparsky 2000) in Shiwilu. Palatalization applies only to /t/ and /l/ but not other coronal consonants, like /s/. To capture this environment, I will assume that the phoneme /l/ is a non-continuant, as argued by Dickey (1997). In Tableau 1, the constraint SHARE-HEIGHT is the markedness constraint driving the assimilation process. It states that an output consonant must share the height feature of a following vowel. The maximally faithful candidate, candidate a), violates SHARE-HEIGHT. Ranked above SHARE-HEIGHT are two constraints, IDENT(HEIGHT)-CONTINUANT and MAX. IDENT(HEIGHT)-CONTINUANT rules out candidate d) in a way that modifies the height of the vowel rather than the consonant and by way of this modification satisfies SHARE-HEIGHT. The violation of IDENT(HEIGHT)-CONTINUANT, however, is fatal. MAX rules out candidate c) by restricting the deletion of the initial consonant to satisfy SHARE-HEIGHT. That leaves the winning candidate, b), which violates only the lower ranking IDENT(HEIGHT)-C for the initial consonant /l/ not matching the height specification of the following vowel /i/.

Tableau 1

/-l+i+dək/	IDENT(HEIGHT)-CONTINUANT <sup>6</sup>	MAX	SHARE-HEIGHT	IDENT(HEIGHT)-C
a. [-lidək]			*!	
b. <sup>☞</sup> [-ʎidək]				*
c. [-idək]		*!		
d. [-lədək]	*!			

Another example of this constraint hierarchy that results in palatalization in Shiwilu appears in Tableau 2. The process of palatalization applies to /t/ as well as to /l/. The same constraints are at play, and in the same way, the maximally faithful candidate, a), violates SHARE-HEIGHT, while the

<sup>6</sup> I am assuming that /l/ is a non-continuant. See Dickey (1997) for arguments.

optimal candidate just violates the lower ranking IDENT(HEIGHT)-C. The other candidates, d) and c), incur fatal violations of IDENT(HEIGHT)-CONTINUANT and MAX, respectively.

Tableau 2

/-at+-iŋ /	IDENT(HEIGHT)-CONTINUANT	MAX	SHARE-HEIGHT	IDENT(HEIGHT)-C
a. [-atiŋ]			*!	
b. <sup>☞</sup> [-aciŋ]				*
c. [-aiŋ]		*!		
d. [-atəŋ]	*!			

Palatalization in Shiwilu does not apply to continuants (except for /l/ which we are considering a non-continuant). Tableau 3 shows that the segment /s/ escapes the palatalization process. The maximally faithful candidate, a), is chosen as optimal. Though it violates SHARE-HEIGHT, the other candidates incur fatal violations of the the higher ranking constraints, IDENT(HEIGHT)-CONTINUANT and MAX.

Tableau 3


/-s+ik+waʔ /	IDENT(HEIGHT)-CONTINUANT	MAX	SHARE-HEIGHT	IDENT(HEIGHT)-C
a. <sup>☞</sup> [-sikwaʔ]			*	*
b. [-ʃikwaʔ]	*!			*
c. [-ikwaʔ]		*!		
d. [-səkwəʔ]	*!			

Another phonological process triggering morphophonological allomorphy in Shiwilu is epenthesis. Epenthesis can be seen in the first person forms with the morphemes  $-(ə)k$  and  $-(ə)ku$ . Schwa epenthesis takes place after TAM exponents that end in consonants, with the exception of glottalized  $k$  and glottalized vowels. The markedness constraint at play in creating the epenthesis is a coda condition, CODACOND, which disfavors the existence of a segment in the coda position.<sup>7</sup> The maximally faithful candidate in a) violates the high ranking CODACOND constraint. Candidates c)

<sup>7</sup> I would like to thank Adam Ussishkin for suggesting CODACOND and \*U as solutions for these data.

and d) incur fatal violations of MAX and \*U respectively. The constraint \*U disfavors the vowel ‘u’ as an epenthetic vowel. The candidate in b) violates DEP and \*ə, but DEP and \*ə are the lower ranking constraints, and these are not fatal violations.

Tableau 4

	/-at+ku/	CODACOND	MAX	*U	DEP	*ə
a.	[-atku]	*!				
b.	 [-atəku]				*	*
c.	[-aku]		*!			
d.	[-atuku]			*!	*	

Now that these instances of phonologically conditioned allomorphy are clear, the next section details the morphosyntactic conditions that trigger allomorphy in the Shiwilu data.

**4.2 FIRST PERSON EXCLUSIVE.** First person exclusive is a term used to describe a pronominal form that makes reference to the SPEAKER (first person) to the exclusion of the ADDRESSEE (or second person). Table 17 shows the decomposed TAM, person and number VIs with the emerging patterns highlighted in shades of grey.

Table 17: First person exclusive forms

TAM paradigm		Singular		Plural		
		TAM	Person	TAM	Person	Number
Tense	1 Actual non-future	-l	-ək	-ʌ	-i	-dək
	2 Future non-actual	-əc	-ək	-əc	-i	-dək
Deontic modality	3 Unfulfilled wish	-aʔ	-ka	-aʔ	-ku	-dək
	4 Desiderative	-inaʔ	-ka	-inaʔ	-ku	-dək
	5 Obligative	-piʔnakʔ	-∅	-piʔnakʔ	-ku	-dək
Other modality	6 Conditional	-nans	-əku	-nans	-əku	-dək
	7 Subjunctive	-at	-əku	-at	-əku	-dək
Aspect	8 Durative	-aʔs	-əku	-aʔs	-əku	-dək
	9 Intermittent action	-s	-əku	-s	-əku	-dək
Exponent(s)			-(ə)k/-ka/ -∅/- (ə)ku		-i/- (ə)ku	-dək

It is clear that the plural VI *-dək* is constant across all TAM conditions in the first person exclusive. The interesting pattern is that person VIs vary depending on the context of TAM. The deontic modals pattern together in that the person VIs are the same within the category deontic, *-ka* in the singular and *-ken* in the plural.<sup>8</sup> The only exception is the null person exponent in the singular form of the obligative mood paradigm, which patterns differently, except in the second person (which we will return to in Section 5.3). Another interesting condition on the person VIs is that plural number appears to condition the person VI in the tense and deontic categories. Other conditioning contexts emerge throughout the data. Now, we turn to the decomposition of first person inclusive forms. Then, I propose the VIs that spell out TAM and first person forms.

**4.3 FIRST PERSON INCLUSIVE.** The first person inclusive pronominal form describes a combination of the features SPEAKER and ADDRESSEE. Table 18 shows the decomposition into TAM, person and number exponents.

Table 18: First person inclusive forms

TAM paradigm		Singular		Plural		
		TAM	Person	TAM	Person	Number
Tense	1 Actual non-future	-l	-ək	-l	-ək	-wa <sup>?</sup>
	2 Future non-actual	-at	-ər	-at	-ər	-wa <sup>?</sup>
Deontic modality	3 Unfulfilled wish	-a <sup>?</sup>	-ka	-a <sup>?</sup>	-ka	-wa <sup>?</sup>
	4 Desiderative	-ina <sup>?</sup>	-ka	-ina <sup>?</sup>	-ka	-wa <sup>?</sup>
	5 Obligative	-pi <sup>?</sup> nak <sup>?</sup>	-∅	-pi <sup>?</sup> nak <sup>?</sup>	-∅	-wa <sup>?</sup>
Other modality	6 Conditional	-nans	-u <sup>?</sup>	-nans	-u <sup>?</sup>	-wa <sup>?</sup>
	7 Subjunctive	-at	-ək <sup>9</sup>	-at	-ək	-wa
Aspect	8 Durative	-a <sup>?</sup> s	-ik	-a <sup>?</sup> s	-ik	-wa <sup>?</sup>
	9 Intermittent action	-s	-ik	-s	-ik	-wa <sup>?</sup>
Exponent(s)			-ək/-ər/-u <sup>?</sup> -ka/-∅/-ik		-ək/-ər/-u <sup>?</sup> -ka/-∅/-ik	-wa <sup>?</sup>

<sup>8</sup> Thanks to Jeff Punske for pointing out to me that these three modals fall into the natural semantic class of deontic modality.

<sup>9</sup> An interesting pattern is that the subjunctive mood syncretizes with the tense categories throughout multiple paradigms.

Similar to the situation outlined for first person exclusive forms, tense, deontic modality and aspect pattern together in conditioning person exponents. Additionally, many of the first person inclusive VIs are the same as the VIs for first person exclusive, for example: *-ə́k* for tense and *-kə* for deontic modality. The first person inclusive does have two unique VIs that are different from the first person exclusive, namely, the plural VI *-waʔ* and potentially the first person inclusive VI conditioned by aspect, *-ik*.

Before presenting the second and third person paradigms, I propose Vocabulary Items and corresponding features for TAM and forms involving first person. First, the TAM exponents are in (11) with the VI on the left and the TAM feature it realizes on the right.

- (11) TAM VIs
- a. *-l/-l̥* ⇔ NON FUTURE
  - b. *-ə́c/-at<sup>10</sup>* ⇔ FUTURE
  - c. *-aʔ* ⇔ UNFULFILLED WISH
  - d. *-inaʔ* ⇔ DESIDERATIVE
  - e. *-piʔnakʔ* ⇔ OBLIGATIVE
  - f. *-nans* ⇔ CONDITIONAL
  - g. *-at/-ac* ⇔ SUBJUNCTIVE
  - h. *-aʔs* ⇔ DURATIVE
  - i. *-s* ⇔ INTERMITTENT ACTION

Since there is considerable overlap between the first person exclusive and first person inclusive exponents, the VIs that are representative of both exclusive and inclusive forms are in (12) with the VI on the left and the features it spells out on the right. The context for insertion is represented by the “in the environment of” (*/\_\_\_*) notation. For a VI that is underspecified for person, as in (12e and f), the absence of a person feature specification means that these VIs are compatible with a terminal node that lacks a PARTICIPANT node. This situation results in the interpretation of a non-participant, or third person.

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<sup>10</sup> Forms (6a), (6b) and (6g) do not constitute two separate VIs. They are distinguishable by phonological factors rather than morphosyntactic factors. See Section 4.1.1 for more detail.

- (12) VIs for first person
- a. -əɾ ⇔ SPEAKER, ADDRESSEE/ \_\_FUTURE
  - b. -(ə)k ⇔ SPEAKER/ \_\_TENSE
  - c. -ka ⇔ SPEAKER/ \_\_DEONTIC
  - d. -∅ ⇔ SPEAKER/ \_\_OBLIGATIVE
  - e. -(ə)ku ⇔ SPEAKER
  - f. -i ⇔ / \_\_TENSE
  - g. -ik ⇔ / \_\_ASPECT

Next, Section 4.3 outlines the decomposition of the second person forms revealing patterns very similar to those found in the first person exclusive paradigm.

**4.4 SECOND PERSON.** The second person forms reveal patterns similar to those of the first person exclusive forms but instantiated by different VIs. This is an initial indication of metasyncretism, the motivation proposing that Impoverishment operations at play in Shiwilu morphology.

Table 19: Second person forms

TAM paradigm		Singular		Plural		
		TAM	Person	TAM	Person	Number
Tense	1 Actual non-future	-l	-a	-l	-a	-ma
	2 Future non-actual	-əc	-u	-əc	-u	-ma
Deontic modality	3 Unfulfilled wish	-aʔ	-ma	-aʔ	-ma	-maʔ
	4 Desiderative	-inaʔ	-ma	-inaʔ	-ma	-maʔ
	5 Obligative	-piʔnakʔ	-ma	-piʔnakʔ	-ma	-maʔ
Other modality	6 Conditional	-nans	-iŋ	-nans	-iŋ	-maʔ
	7 Subjunctive	-ac	-iŋ	-ac	-iŋ	-naʔ
Aspect	8 Durative	-aʔs	-iŋ	-aʔs	-iŋ	-maʔ
	9 Intermittent action	-s	-iŋ	-s	-iŋ	-maʔ
Exponent(s)			-a/-u/-ma/ -iŋ/-ŋ		-a/-u/-ma/ -iŋ/-ŋ	-ma/-maʔ/ -naʔ

The patterns that emerge in the second person forms are similar to those described for the first persons. Deontic modality patterns together apart from other modality and aspect. Tense also behaves differently from the other TAM categories. The second person paradigm differs from the

first person exclusive in that it has distinct forms for the realization of the two tenses (but shares this property with the first person inclusive). The VIs for second person are listed in (13).

- (13) VIs for second person
- a. -a           ↔ ADDRESSEE/ \_\_NON FUTURE
  - b. -ma         ↔ ADDRESSEE/ \_\_DEONTIC
  - c. -iŋ         ↔ ADDRESSEE
  - d. -u           ↔ / \_\_FUTURE

The next section, Section 4.4, shows the decomposition of the third person forms. In Section 4.5 the number VIs will be specified. After that, a sample derivation in DM will be provided.

**4.5 THIRD PERSON.** The third person forms do not show nearly as much regularity as the first person exclusive and second person forms. Table 20 shows the decomposition of the third person forms, and (14) lists the VIs for third person.

Table 20: Third person forms

TAM paradigm		Singular		Plural		
		TAM	Person	TAM	Person	Number
Tense	1 Actual, non-future	-ɰ	-i	-ɰ	-i	-na
	2 Future, non-actual	-əc	-uŋ	-əc	-u	-na
Deontic modality	3 Unfulfilled wish	-aʔ	-a	-aʔ	-ərk	-a
	4 Desiderative	-inaʔ	-a	-inaʔ	-ərk	-a
	5 Obligative	-piʔnakʔ	-∅	-piʔnakʔ	-ərk	-ək
Other modality	6 Conditional	<del>nan</del> <sup>11</sup>	-uʔ	-nan-s	-ta	-ər
	7 Subjunctive	-ac	-i	-ac	-i	-na
Aspect	8 Durative	-aʔs	-ik	-aʔs	-ər	-∅
	9 Intermittent action	-s	-uʔ	-aʔs	-ər	-∅
Exponent			-i/-uŋ/ -a/-∅/-uʔ		-i/-u/-ərk/ -ta/-ər	-na/-a/ -ək/-ər/-∅

<sup>11</sup> Strikethrough font indicates that the phonological string is deleted in the surface form. For example, the third person singular conditional form is *-suʔ*.

- (14) VIs for third person
- b. -ərk ⇔ /\_\_DEONTIC, GROUP
  - c. -a ⇔ /\_\_DEONTIC
  - d. -u(ŋ) ⇔ /\_\_FUTURE
  - e. -uʔ ⇔ /\_\_OTHER.MODAL
  - f. -i ⇔ /\_\_TENSE
  - g. -ik ⇔ /\_\_ASPECT
  - h. -∅ ⇔ elsewhere

The third person exponents are different from the exponents of other persons in some significant ways. First, there is no consistent number exponent, which is indeed the case for the other persons. Many of the third person exponents have the same form as exponents of first person (like -ə̀k and -i) and of second person (like -a).

**4.6 NUMBER.** The VIs that realize number do not show as much allomorphy as the person forms. For instance, there is one VI that spells out plural in the first person exclusive, namely -də̀k, (15a) in the complete list in (15) below. There are a few cases, however, for which the plural VI is conditioned by TAM features, as in (15d).

- (15) Number VIs
- a. -naʔ ⇔ GROUP/\_ADDRESSEE, SUBJUNCTIVE
  - b. -ma ⇔ GROUP/\_ADDRESSEE, TENSE
  - c. -waʔ ⇔ GROUP/\_SPEAKER, ADDRESSEE
  - d. -ə̀k ⇔ GROUP/\_OBLIGATIVE
  - e. -ə̀r ⇔ GROUP/\_CONDITIONAL
  - f. -na ⇔ GROUP/\_TENSE
  - g. -a ⇔ GROUP/\_DEONTIC
  - h. -də̀k ⇔ GROUP/\_SPEAKER
  - i. -maʔ ⇔ GROUP/\_ADDRESSEE
  - j. -∅ ⇔ elsewhere

Table 21 provides a summary of the person VIs and the syncretism and metasyncretism that has emerged in the decomposition of the Shiwilu paradigms. The metasyncretic patterns are outlined in a dark black perimeter.

Table 21: Summary of syncretism and metasyncretism

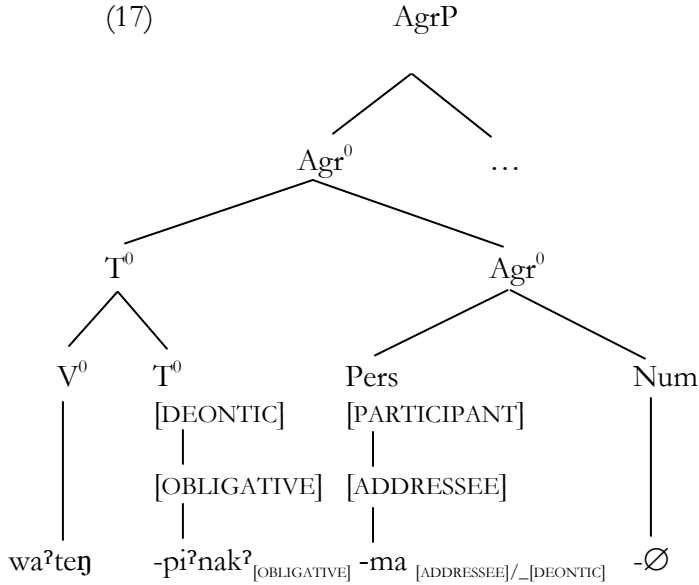
Person	Tense				Deontic modality		Other modality/aspect							
	Singular		Plural		Singular	Plural	Singular				Plural			
	FUT	NON. FUT	FUT	NON. FUT	DEONTIC		COND	SUBJ	DUR	INT	COND	SUBJ	DUR	INT
First excl.	-ə̃k		-i		-ka	-ku	-(ə̃)ku							
First incl.		-ə̃r	-ə̃k	-ə̃r			-uʔ	-ə̃k	-ik		-uʔ	-ə̃k	-ik	
Second	-a	-u	-a	-u	-ma		-iŋ							
Third	-i	-uŋ	-i		-a	-ə̃rk	-uʔ	-i	-ik	-uʔ	-ta	-i	-ə̃r	

The next section shows how Vocabulary Insertion is determined by the Subset Principle, Impoverishment, feature copy and feature geometries.

**5 A DM Analysis.** To demonstrate the realizational nature of Vocabulary Insertion in DM, the tree in (17) diagrams the example phrase that was previously introduced in (10), repeated in (16).

- (16) waʔteŋ-piʔnakʔma  
 wait-2.SG.OBLIG  
 ‘you should have waited’ (Bendor-Samuel 1958: 107)

The structure in (17) can be derived by way of successive cyclic head movement with the verb adjoining to T<sup>0</sup> followed by the verb along with T<sup>0</sup> adjoining to Agr<sup>0</sup>. We can either assume that the Agr<sup>0</sup> node splits by way of fission into two slots, one for Person and another for Number, or we can assume that the internal structure of AgrP involves layers for a PersonP and a NumberP. For the current analysis, it makes no difference which of the two options we assume. I will assume the latter since my analysis thus far has suggested a separate morphosyntactic slot for number.



The following section details how the Subset Principle determines winning VI in many of the VI competitions in the Shiwilu data. After that, the VI competitions that the Subset Principle alone cannot determine are shown to be resolved by the feature geometries along with feature copy and Impoverishment rules.

**5.1 The Subset Principle.** According to the Subset Principle (Halle 1997), the features of the winning VI will match all or a subset of the features of the terminal node in the syntax. If a VI has a feature that is not specified in the syntactic terminal node, that VI cannot win Vocabulary Insertion. Additionally, if more than one VI has matching features, the one with the highest number of matching features will win Vocabulary Insertion. Many of the VI competitions in the Shiwilu data are resolved by the Subset Principle.

In (18), the unfulfilled wish, first person exclusive singular is represented by the semantic make-up of the features, UNFULFILLED-WISH and SPEAKER with the lack of specification of the INDIVIDUATION node representing singular. The VI that wins insertion in the TAM node is the exact match in c), determined by the Subset Principle. It has an UNFULFILLED-WISH feature that

matches the UNFULFILLED-WISH feature of the syntactic terminal node. None of the other candidates in a), b), or d) through i) have the feature UNFULFILLED-WISH and are therefore ruled out by the Subset Principle, shown by the strikethrough. The VI that wins insertion into the person node is d), which is the most specific while still representing a subset of the features, SPEAKER in the environment of a DEONTIC modal, which is the dominating node of UNFULFILLED-WISH on the TAM feature geometry established in Section 3.2. In (18), the VI in bold-faced type is the winning VI, and the VIs with strikethrough type are ruled out by the Subset Principle. The VIs that do not have strikethrough but are not in bold face type are eligible for Vocabulary Insertion according to the Subset Principle, though they are beaten out by a more specific VI that obeys the Subset Principle.

(18) -a<sup>2</sup>-ka Unfulfilled wish, first person exclusive, singular

UNFULFILLED- WISH	SPEAKER
a. <del>1/ɬ</del> <sub>[NON-FUTURE]</sub>	a. <del>əɾ</del> <sub>[SPEAKER, ADDRESSEE/_FUTURE]</sub>
b. <del>əc/at</del> <sub>[FUTURE]</sub>	b. <del>∅</del> <sub>[SPEAKER/_OBLIGATIVE]</sub>
c. -a <sup>2</sup> <sub>[UNFULFILLED WISH]</sub>	c. <del>a</del> <sub>[ADDRESSEE/_NON-FUTURE]</sub>
d. <b>ina<sup>2</sup></b> <sub>[DESIDERATIVE]</sub>	d. <b>-ka</b> <sub>[SPEAKER/_DEONTIC]</sub>
e. <del>pi<sup>2</sup>nak<sup>2</sup></del> <sub>[OBLIGATIVE]</sub>	e. <del>(ə)k</del> <sub>[SPEAKER/_TENSE]</sub>
f. <del>nans</del> <sub>[CONDITIONAL]</sub>	f. <del>ma</del> <sub>[ADDRESSEE/_DEONTIC]</sub>
g. <del>at/ae</del> <sub>[SUBJUNCTIVE]</sub>	g. <del>(ə)ku</del> <sub>[SPEAKER]</sub>
h. <del>a<sup>2</sup>s</del> <sub>[DURATIVE]</sub>	h. <del>in</del> <sub>[ADDRESSEE]</sub>
i. <del>s</del> <sub>[INTERMITTENT ACTION]</sub>	i. <del>ərk</del> <sub>[/_DEONTIC, GROUP]</sub>
	j. <del>u(ŋ)</del> <sub>[/_FUTURE]</sub>
	k. <del>i</del> <sub>[/_TENSE]</sub>
	l. -a <sub>[/_DEONTIC]</sub>
	m. <del>ik</del> <sub>[/_ASPECT]</sub>
	n. <del>u<sup>2</sup></del> <sub>[/_OTHER-MODAL]</sub>

In (19), the non-future, first person exclusive singular is the semantic make-up of the features, NON-FUTURE, SPEAKER and lack of specification of the INDIVIDUATION node representing singular. Again, for the T<sup>0</sup> or TAM node, the VI that wins insertion is the one in a) that matches the NON-FUTURE feature of the syntactic terminal node. In the person node, the Subset Principle also

determines the winning VI. The VI in e) is the most highly specified subset of the feature in the terminal node, SPEAKER, in the environment of NON-FUTURE, which is dominated by TENSE (the feature that e) actually refers to) in the TAM feature geometry.

(19) -l-ək Non-future, first person exclusive, singular

<p>[ NON-FUTURE ]</p> <p>a. -l/ɬ [NON-FUTURE]</p> <p>b. -əc/at [FUTURE]</p> <p>c. -a<sup>2</sup> [UNFULFILLED WISH]</p> <p>d. -ina<sup>2</sup> [DESIDERATIVE]</p> <p>e. -pi<sup>2</sup>na<sup>2</sup> [OBLIGATIVE]</p> <p>f. -nans [CONDITIONAL]</p> <p>g. -at/ae [SUBJUNCTIVE]</p> <p>h. -a<sup>2</sup>s [DURATIVE]</p> <p>i. -s [INTERMITTENT ACTION]</p>	<p>[ SPEAKER ]</p> <p>a. -əɾ [SPEAKER, ADDRESSEE/_FUTURE]</p> <p>b. -ɔ [SPEAKER/_OBLIGATIVE]</p> <p>c. -a [ADDRESSEE/_NON-FUTURE]</p> <p>d. -ka [SPEAKER/_DEONTIC]</p> <p>e. <b>-(ə)k</b> [SPEAKER/_TENSE]</p> <p>f. -ma [ADDRESSEE/_DEONTIC]</p> <p>g. -(ə)ku [SPEAKER]</p> <p>h. -iŋ [ADDRESSEE]</p> <p>i. -ərk [/_DEONTIC, GROUP]</p> <p>j. -u(ŋ) [/_FUTURE]</p> <p>k. -i [/_TENSE]</p> <p>l. -a [/_DEONTIC]</p> <p>m. -ik [/_ASPECT]</p> <p>n. -u<sup>2</sup> [/_OTHER-MODAL]</p>
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The Subset Principle is also at play in determining Vocabulary Insertion in (20). The TAM VI with the CONDITIONAL feature in f) matches the TAM terminal node. In the person node, the VI in g) is the most highly specified candidate that still constitutes a subset of the features of the terminal node.

(20) -nans-əku Conditional, first person exclusive, singular

<p>[ CONDITIONAL ]</p> <p>a. -l/ɬ [NON-FUTURE]</p> <p>b. -əc/at [FUTURE]</p> <p>c. -a<sup>2</sup> [UNFULFILLED WISH]</p> <p>d. -ina<sup>2</sup> [DESIDERATIVE]</p> <p>e. -pi<sup>2</sup>na<sup>2</sup> [OBLIGATIVE]</p> <p>f. -nans [CONDITIONAL]</p> <p>g. -at/ae [SUBJUNCTIVE]</p> <p>h. -a<sup>2</sup>s [DURATIVE]</p> <p>i. -s [INTERMITTENT ACTION]</p>	<p>[ SPEAKER ]</p> <p>a. -əɾ [SPEAKER, ADDRESSEE/_FUTURE]</p> <p>b. -ɔ [SPEAKER/_OBLIGATIVE]</p> <p>c. -a [ADDRESSEE/_NON-FUTURE]</p> <p>d. -ka [SPEAKER/_DEONTIC]</p> <p>e. -(ə)k [SPEAKER/_TENSE]</p> <p>f. -ma [ADDRESSEE/_DEONTIC]</p> <p><b>g. -(ə)ku</b> [SPEAKER]</p> <p>h. -iŋ [ADDRESSEE]</p> <p>i. -ərk [/_DEONTIC, GROUP]</p> <p>j. -u(ŋ) [/_FUTURE]</p>
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- k. ~~i~~ [/\_TENSE]
- l. ~~a~~ [/\_DEONTIC]
- m. ~~ik~~ [/\_ASPECT]
- n. -u<sup>?</sup> [/\_OTHER-MODAL]

In (21), the Subset Principle determines the winning candidates in the TAM, person and number nodes. In the TAM node, the VI in i) matches the features of the terminal node. In the person node, the VI in g) is the most highly specified candidate that adheres to the Subset Principle, and in the number node, the VI in h) is the most specific candidate that obeys the Subset Principle.

(21) -s-əku-dək Intermittent action, first person exclusive, plural

[ INTERMITTENT- ACTION ]	[ SPEAKER ]	[ GROUP ]
a. <del>ɪ</del> /ɪ [NON-FUTURE]	a. <del>ə</del> [SPEAKER, ADDRESSEE/_FUTURE]	a. <del>na</del> <sup>2</sup> [GROUP/_ADDRESSEE, SUBJUNCTIVE]
b. <del>əc</del> /at [FUTURE]	b. <del>∅</del> [SPEAKER/_OBLIGATIVE]	b. <del>ma</del> [GROUP/_ADDRESSEE, TENSE]
c. <del>a</del> <sup>2</sup> [UNFULFILLED WISH]	c. <del>a</del> [ADDRESSEE/_NON-FUTURE]	c. <del>wa</del> <sup>2</sup> [GROUP/_SPEAKER, ADDRESSEE]
d. <del>ina</del> <sup>2</sup> [DESIDERATIVE]	d. <del>ka</del> [SPEAKER/_DEONTIC]	d. <del>ək</del> [GROUP/_OBLIGATIVE]
e. <del>pi<sup>2</sup>na<sup>2</sup></del> [OBLIGATIVE]	e. <del>(ə)k</del> [SPEAKER/_TENSE]	e. <del>ə</del> [GROUP/_CONDITIONAL]
f. <del>nans</del> [CONDITIONAL]	f. <del>ma</del> [ADDRESSEE/_DEONTIC]	f. <del>na</del> [GROUP/_TENSE]
g. <del>at</del> /ae [SUBJUNCTIVE]	<b>g. -(ə)ku</b> [SPEAKER]	g. <del>a</del> [GROUP/_DEONTIC]
h. <del>a</del> <sup>2</sup> s [DURATIVE]	h. <del>i</del> [ADDRESSEE]	<b>h. -dək</b> [GROUP/_SPEAKER]
i. -s [INTERMITTENT ACTION]	i. <del>ək</del> [/_DEONTIC, GROUP]	i. <del>ma</del> <sup>2</sup> [GROUP/_ADDRESSEE]
	j. <del>u(ə)</del> [/_FUTURE]	j. -∅
	k. <del>i</del> [/_TENSE]	
	l. <del>a</del> [/_DEONTIC]	
	m. <del>ik</del> [/_ASPECT]	
	n. <del>u</del> <sup>2</sup> [/_OTHER-MODAL]	

An example of a Vocabulary Insertion involving a second person form is presented in (22).

Just like as in the former examples, the Subset Principle determines the winning VIs: the VI in g) for TAM, the VI in h) for person, and the VI in a) for number.

(22) -ac-ij Subjunctive, second person plural

[ SUBJUNCTIVE ]	[ ADDRESSEE ]	[ GROUP ]
a. <del>1/f</del> [NON-FUTURE]	a. <del>ər</del> [SPEAKER, ADDRESSEE/_FUTURE]	<b>a.-na<sup>?</sup></b> [GROUP/ADDRESSEE, SUBJUNCTIVE]
b. <del>əc/at</del> [FUTURE]	b. <del>∅</del> [SPEAKER/_OBLIGATIVE]	b. <del>ma</del> [GROUP/_ADDRESSEE, TENSE]
c. <del>a<sup>?</sup></del> [UNFULFILLED WISH]	c. <del>a</del> [ADDRESSEE/_NON-FUTURE]	c. <del>wa<sup>?</sup></del> [GROUP/_SPEAKER, ADDRESSEE]
d. <del>ina<sup>?</sup></del> [DESIDERATIVE]	d. <del>ka</del> [SPEAKER/_DEONTIC]	d. <del>ək</del> [GROUP/_OBLIGATIVE]
e. <del>pi<sup>?</sup>nak<sup>?</sup></del> [OBLIGATIVE]	e. <del>(ə)k</del> [SPEAKER/_TENSE]	e. <del>ər</del> [GROUP/_CONDITIONAL]
f. <del>nans</del> [CONDITIONAL]	f. <del>ma</del> [ADDRESSEE/_DEONTIC]	f. <del>na</del> [GROUP/_TENSE]
g. <del>at/ac</del> [SUBJUNCTIVE]	g. <del>(ə)ku</del> [SPEAKER]	g. <del>a</del> [GROUP/_DEONTIC]
h. <del>a<sup>?</sup>s</del> [DURATIVE]	<b>h. -ij</b> [ADDRESSEE]	h. <del>dək</del> [GROUP/_SPEAKER]
i. <del>s</del> [INTERMITTENT ACTION]	i. <del>ək</del> [/_DEONTIC, GROUP]	i. <del>ma<sup>?</sup></del> [GROUP/_ADDRESSEE]
	j. <del>u(ə)</del> [/_FUTURE]	j. <del>∅</del>
	k. <del>i</del> [/_TENSE]	
	l. <del>a</del> [/_DEONTIC]	
	m. <del>ik</del> [/_ASPECT]	
	n. <del>u<sup>?</sup></del> [/_OTHER-MODAL]	

As has been exemplified in this section, many of the instances of Vocabulary Insertion are determined by the Subset Principle. Unfortunately, not all cases can be explained in this way. There are a number of more difficult examples that the Subset Principle alone cannot determine. These examples are treated by way of the operation of Impoverishment, feature copy, and by referring to the feature geometric representation of morphosyntactic features.

**5.2 Impoverishment and feature copy.** To address the cases of Vocabulary Insertion that cannot be resolved by referring to the Subset Principle also, the operation of Impoverishment can be employed. In (23), the correct TAM VI is chosen by the Subset Principle. In the person node, however, the Subset Principle would chose the VI in d), but the actual VI that wins insertion is g). Likewise, in the group node, the Subset Principle would not be able to chose between the VIs in g) and h), when h) is the actual VI that wins insertion.

(23) -a<sup>2</sup>-ku-dək Unfulfilled wish, first person exclusive, singular

[ UNFULFILLED-  
WISH ]

[ SPEAKER ]

[ GROUP ]

- |  |  |   |
|--|--|---|
| a. -l/ɤ [NON-FUTURE]                             | a. -əɾ [SPEAKER, ADDRESSEE/_FUTURE]      | a. -na <sup>2</sup> [GROUP/_ADDRESSEE, SUBJUNCTIVE] |
| b. -əc/at [FUTURE]                               | b. -∅ [SPEAKER/_OBLIGATIVE]              | b. -ma [GROUP/_ADDRESSEE, TENSE]                    |
| c. -a <sup>2</sup> [UNFULFILLED WISH]            | c. -a [ADDRESSEE/_NON-FUTURE]            | c. -wa <sup>2</sup> [GROUP/_SPEAKER, ADDRESSEE]     |
| d. -ina <sup>2</sup> [DESIDERATIVE]              | d. -ka [SPEAKER/_DEONTIC]                | d. -ək [GROUP/_OBLIGATIVE]                          |
| e. -pi <sup>2</sup> na <sup>2</sup> [OBLIGATIVE] | e. -(ə)k [SPEAKER/_TENSE]                | e. -əɾ [GROUP/_CONDITIONAL]                         |
| f. -nans [CONDITIONAL]                           | f. -ma [ADDRESSEE/_DEONTIC]              | f. -na [GROUP/_TENSE]                               |
| g. -at/ae [SUBJUNCTIVE]                          | g. -(ə)ku [SPEAKER]                      | g. -a [GROUP/_DEONTIC]                              |
| h. -a <sup>2</sup> s [DURATIVE]                  | h. -in [ADDRESSEE]                       | h. -dək [GROUP/_SPEAKER]                            |
| i. -s [INTERMITTENT ACTION]                      | i. -ər <sup>2</sup> k [/_DEONTIC, GROUP] | i. -ma <sup>2</sup> [GROUP/_ADDRESSEE]              |
|  | j. -u(ŋ) [/_FUTURE]                      | j. -∅   |
|  | k. -i [/_TENSE]                          |   |
|  | l. -a [/_DEONTIC]                        |   |
|  | m. -ik [/_ASPECT]                        |   |
|  | n. -u <sup>2</sup> [/_OTHER-MODAL]       |   |

To solve this problem, an Impoverishment rule that deletes the DEONTIC node of the feature geometry in the environment of SPEAKER and GROUP, formalized in (24), can determine the correct VI for the person as well as for the number node. Once the deontic node is impoverished, the person VI in d) is ruled out by the Subset Principle. The feature DEONTIC is no longer present, so the VI in d) is ruled out by the Subset Principle for having the extraneous feature DEONTIC. In the same way, the number VI in g) is ruled out by the Subset Principle upon impoverishment of the deontic node.

(24) DEONTIC → ∅ / \_\_\_ SPEAKER, GROUP

One problem with the Impoverishment rule in as formulated in (24) is that it should only apply to the first person exclusive paradigm, and first person inclusive paradigm, involving a SPEAKER feature, in addition to an ADDRESSEE feature, is a relevant environment in which the Impoverishment rule in (24) can apply. For this reason, we will need to make reference to negative

feature values. The Impoverishment rule in (24) is reformulated with a negative feature value for the ADDRESSEE feature and a positive value for SPEAKER in (25).

$$(25) \quad \text{DEONTIC} \rightarrow \emptyset / \_ \text{+SPEAKER, -ADDRESSEE, GROUP}$$

Now, this Impoverishment rule will only apply to the first person exclusive paradigm, which is the desired result.

Another case in which Impoverishment is requisite is in (26). To explain why the VIs in e) and g) in the person column are ruled out in favor of k), Impoverishment will be necessary. Also, we need to explain how the VI in h) is inserted instead of the VI in f) in the number node.

$$(26) \quad \text{-}\Lambda\text{-i-d}\emptyset\text{k} \quad \text{Non-future, first person exclusive, plural}$$

[ NON-FUTURE ]	[ SPEAKER ]	[ GROUP ]
a. <b>-1/\Lambda</b> [NON-FUTURE]	a. <del>-\emptyset</del> [SPEAKER, ADDRESSEE/_FUTURE]	a. <del>-na<sup>2</sup></del> [GROUP/_ADDRESSEE, SUBJUNCTIVE]
b. <del>-\emptyset</del> /at [FUTURE]	b. <del>\emptyset</del> [SPEAKER/_OBLIGATIVE]	b. <del>-ma</del> [GROUP/_ADDRESSEE, TENSE]
c. <del>-a<sup>2</sup></del> [UNFULFILLED WISH]	c. <del>-a</del> [ADDRESSEE/_NON-FUTURE]	c. <del>-wa<sup>2</sup></del> [GROUP/_SPEAKER, ADDRESSEE]
d. <del>-ina<sup>2</sup></del> [DESIDERATIVE]	d. <del>-ka</del> [SPEAKER/_DEONTIC]	d. <del>-\emptyset</del> k [GROUP/_OBLIGATIVE]
e. <del>-pi<sup>2</sup>nak<sup>2</sup></del> [OBLIGATIVE]	e. <del>-(\emptyset)</del> k [SPEAKER/_TENSE]	e. <del>-\emptyset</del> [GROUP/_CONDITIONAL]
f. <del>-nans</del> [CONDITIONAL]	f. <del>-ma</del> [ADDRESSEE/_DEONTIC]	f. <del>-na</del> [GROUP/_TENSE]
g. <del>-at/\emptyset</del> [SUBJUNCTIVE]	g. <del>-(\emptyset)</del> ku [SPEAKER]	g. <del>-a</del> [GROUP/_DEONTIC]
h. <del>-a<sup>2</sup>s</del> [DURATIVE]	h. <del>-i</del> [ADDRESSEE]	<b>h. -d\emptyset</b> k [GROUP/_SPEAKER]
i. <del>-s</del> [INTERMITTENT ACTION]	i. <del>-\emptyset</del> k [/_DEONTIC, GROUP]	i. <del>-ma<sup>2</sup></del> [GROUP/_ADDRESSEE]
	j. <del>-u(\eta)</del> [/_FUTURE]	j. <del>\emptyset</del>
	<b>k. -i</b> [/_TENSE]	
	l. <del>-a</del> [/_DEONTIC]	
	m. <del>-ik</del> [/_ASPECT]	
	n. <del>-u<sup>2</sup></del> [/_OTHER-MODAL]	

We could introduce an Impoverishment rule that deletes SPEAKER in the environment of TENSE, and this would make the VI in e) in the person node as well as the VI in f) in the number node ineligible for insertion. Like the Impoverishment rule in (25), this rule must only apply to the first person exclusive paradigm, so we specify the environment of -ADDRESSEE. This Impoverishment rule is formalized in (27) below.

$$(27) \quad \text{SPEAKER} \rightarrow \emptyset / \_ \text{-ADDRESSEE, TENSE}$$

Even with the Impoverishment rule above, we still need to ensure that the VI in k) wins insertion over the VI in g) in the person node. Moreover, the solution of impoverishing the SPEAKER feature of the person node creates a problem in the domain of Vocabulary Insertion into the number node because SPEAKER is a conditioning feature of the following number VI. We need to either keep the SPEAKER feature intact or make sure the SPEAKER feature is copied to the number node before it is impoverished. Since SPEAKER is a primary feature of the VI in g) and the VI in k) is underspecified for PARTICIPANT with just the conditioning feature TENSE, the feature geometries cannot resolve this and the Impoverishment rule with the SPEAKER feature being copied onto the number node is the solution.

Additional evidence for the impoverishment and feature copy solution lies in the fact that this same process applies to more than just the first person exclusive paradigm. In the first person inclusive, the person features SPEAKER and ADDRESSEE are impoverished in the person node but necessary for Vocabulary Insertion in the number node. In the person node, the VIs in g) and h) are more highly specified than the VI that actually gets inserted, the VI in m).

(28) a<sup>2</sup>s-ik-wa<sup>2</sup> Durative, first person inclusive plural

[ DURATIVE ]	[ SPEAKER ADDRESSEE ]	[ GROUP ]
a. <del>ɬ/ɬ</del> [NON-FUTURE]	a. <del>əɾ</del> [SPEAKER, ADDRESSEE/_FUTURE]	a. <del>na<sup>2</sup></del> [GROUP/_ADDRESSEE, SUBJUNCTIVE]
b. <del>əc/at</del> [FUTURE]	b. <del>∅</del> [SPEAKER/_OBLIGATIVE]	b. <del>ma</del> [GROUP/_ADDRESSEE, TENSE]
c. <del>a<sup>2</sup></del> [UNFULFILLED WISH]	c. <del>a</del> [ADDRESSEE/_NON-FUTURE]	c. <b>-wa<sup>2</sup></b> [GROUP/_SPEAKER, ADDRESSEE]
d. <del>ina<sup>2</sup></del> [DESIDERATIVE]	d. <del>ka</del> [SPEAKER/_DEONTIC]	d. <del>ək</del> [GROUP/_OBLIGATIVE]
e. <del>pi<sup>2</sup>na<sup>2</sup></del> [OBLIGATIVE]	e. <del>(ə)k</del> [SPEAKER/_TENSE]	e. <del>əɾ</del> [GROUP/_CONDITIONAL]
f. <del>nans</del> [CONDITIONAL]	f. <del>ma</del> [ADDRESSEE/_DEONTIC]	f. <del>na</del> [GROUP/_TENSE]
g. <del>at/ae</del> [SUBJUNCTIVE]	g. <del>(ə)ku</del> [SPEAKER]	g. <del>a</del> [GROUP/_DEONTIC]
h. <del>a<sup>2</sup>s</del> [DURATIVE]	h. <del>in</del> [ADDRESSEE]	h. <del>dək</del> [GROUP/_SPEAKER]
i. <del>s</del> [INTERMITTENT ACTION]	i. <del>əɾk</del> [/_DEONTIC, GROUP]	i. <del>ma<sup>2</sup></del> [GROUP/_ADDRESSEE]
	j. <del>u(ŋ)</del> [/_FUTURE]	j. <del>∅</del>
	k. <del>ɨ</del> [/_TENSE]	
	l. <del>a</del> [/_DEONTIC]	
	m. <b>-ik</b> [/_ASPECT]	
	n. <del>u<sup>2</sup></del> [/_OTHER-MODAL]	

The Impoverishment rule in (29) deletes the SPEAKER and ADDRESSEE features in the environment of ASPECT. The environment for application of this Impoverishment rule is restricted to the first person inclusive paradigm. Therefore, we specify the +SPEAKER, +ADDRESSEE environment.

(29) SPEAKER, ADDRESSEE  $\rightarrow \emptyset$  / \_\_ +SPEAKER, +ADDRESSEE, ASPECT

These Impoverishment rules have accounted for the problematic VI competitions that could not be determined by the Subset Principle alone. Rather the Impoverishment rules in combination with the Subset Principle result in the desired outcomes. The next section provides some ideas on how to resolve some remaining Vocabulary Insertion puzzles in the Shiwilu data.

**5.3 A remaining puzzle.** There are still some problematic VI competitions. For example, in the obligative mood, the distribution and diversity of person VIs is puzzling. Based on the forms in (30) below, it seems that the condition for the null VI is not phonological. From a phonological perspective, it is perfectly reasonable to expect to see a form like *\*-pi<sup>?</sup>nak<sup>?</sup>ka* for the first persons (exclusive and inclusive), but we do not. We see *-pi<sup>?</sup>nak<sup>?</sup>∅* in (30a). It is apparently not a prosodic constraint because the analogous *-pi<sup>?</sup>nak<sup>?</sup>ma* in (30e) is legal. Likewise if we were to postulate that there is a restriction on having the segment /k/ follow the similarly articulated segment with secondary glottalization /k<sup>?</sup>/, we would be in error. Compare the expected *\*-pi<sup>?</sup>nak<sup>?</sup>ka* to the analogous form in (30b) *-pi<sup>?</sup>nak<sup>?</sup>ku-dək*.

(30) Forms with the obligative mood VI, *piʔnakʔ*

- |   |                                    |
|---|------------------------------------|
| a. piʔnakʔ-∅<br>OBLIG-1EXCL.SINGULAR    | e. piʔnakʔ-ma<br>OBLIG-2.SINGULAR  |
| b. piʔnakʔ-ku-dək<br>OBLIG-1EXCL-PLURAL | f. piʔnakʔ-ma-ma<br>OBLIG-2-PLURAL |
| c. piʔnakʔ-∅<br>OBLIG-1INCL.SINGULAR    | g. piʔnakʔ-∅<br>OBLIG-3-SINGULAR   |
| d. piʔnakʔ-∅-waʔ<br>OBLIG-1INCL-PLURAL  | h. pin-ərək-ək<br>OBLIG-3-PLURAL   |

Looking at this problem in terms of DM, it becomes clear that the Subset Principle determines the VI that is inserted in the first person exclusive singular form in the obligative mood. For simplification, just the VIs that are relevant for this environment according to the Subset Principle are shown. In (31), the person VI in a) is the most highly specified for the person node and therefore wins Vocabulary Insertion.

(31) piʔnakʔ-∅ Obligative, first person exclusive singular

- |                                     |  |
|-------------------------------------|--|
| [ OBLIGATIVE ]                      | [ SPEAKER ]                            |
| a. -piʔnakʔ <sub>[OBLIGATIVE]</sub> | a. -∅ <sub>[SPEAKER/_OBLIGATIVE]</sub> |
|                                     | b. -ka <sub>[SPEAKER/_DEONTIC]</sub>   |
|                                     | c. -ma <sub>[ADDRESSEE/_DEONTIC]</sub> |
|                                     | d. -(ə)ku <sub>[SPEAKER]</sub>         |
|                                     | e. -iŋ <sub>[ADDRESSEE]</sub>          |
|                                     | f. -ərək <sub>[/_DEONTIC, GROUP]</sub> |
|                                     | g. -a <sub>[/_DEONTIC]</sub>           |

The more complicated VI competition is in the first person exclusive plural. In the person node, there are two VIs, those in a) and b) that are more highly specified for conditioning context than d). Similarly, in the number node, there are two VIs, b) and c) that are more highly specified for conditioning context than d).

(32) piʔnakʔ-ku-dək Obligative, first person exclusive plural

[ OBLIGATIVE ]	[ SPEAKER ]	[ GROUP ]
a. -piʔnakʔ [OBLIGATIVE]	a. -∅ [SPEAKER/_OBLIGATIVE]	a. <del>-waʔ</del> [GROUP/_SPEAKER, ADDRESSEE]
	b. -ka [SPEAKER/_DEONTIC]	b. -ək [GROUP/_OBLIGATIVE]
	c. <del>-ma</del> [ADDRESSEE/_DEONTIC]	c. -a [GROUP/_DEONTIC]
	d. <b>-(ə)ku</b> [SPEAKER]	d. <b>-dək</b> [GROUP/_SPEAKER]
	e. <del>-iŋ</del> [ADDRESSEE]	e. -maʔ [GROUP/_ADDRESSEE]
	f. -ərək [/_DEONTIC, GROUP]	
	g. -a [/_DEONTIC]	

It seems, then, that the conditioning context is impoverished, and this Impoverishment rule affects both the person and number nodes before Vocabulary Insertion. A new impoverishment rule is not needed, however. The rule in (25), repeated here as (32), applies to this form as well to impoverish the DEONTIC node and block the more highly specified person VI in a). This impoverishment rule carries its effects over to the number node, rendering the number VIs in b) and c) ineligible for Vocabulary Insertion.

(32) DEONTIC → ∅ / \_\_\_ +SPEAKER, -ADDRESSEE, GROUP

The Subset Principle also determines the insertion of the most highly specified person VI in a) into the first person inclusive forms. In the second person forms, however, this VI is ineligible, since it is specified only for SPEAKER and not for ADDRESSEE. In the second person, the VI in c) is chosen for insertion by way of the Subset Principle.

(33) piʔnakʔ-ma-maʔ Obligative, second person, plural

[ OBLIGATIVE ]	[ ADDRESSEE ]	[ GROUP ]
a. -piʔnakʔ [OBLIGATIVE]	a. <del>∅</del> [SPEAKER/_OBLIGATIVE]	a. <del>-waʔ</del> [GROUP/_SPEAKER, ADDRESSEE]
	b. <del>ka</del> [SPEAKER/_DEONTIC]	b. -ək [GROUP/_OBLIGATIVE]
	c. <b>-ma</b> [ADDRESSEE/_DEONTIC]	c. -a [GROUP/_DEONTIC]
	d. <del>-(ə)ku</del> [SPEAKER]	d. <del>-dək</del> [GROUP/_SPEAKER]
	e. <del>-iŋ</del> [ADDRESSEE]	e. <b>-maʔ</b> [GROUP/_ADDRESSEE]
	f. -ərək [/_DEONTIC, GROUP]	
	g. -a [/_DEONTIC]	

The Subset Principle determines the winning VI in the person node,. The VI in c) is the most specific subset of the ADDRESSEE feature of the person node and the conditioning TAM feature. In the number node, however, we need to eliminate the VIs in b) and c) from eligibility for Vocabulary Insertion. There are two potential solutions, one lies in the syntactic relationship between the nodes and the other lies in the nature of the feature geometric representations of the features. The VIs in b), c) and e) are on equal ground in terms of matching the GROUP feature of the number node. Additionally, each of these VIs specifies one conditioning feature. The feature that sets the desired VI in e) apart from b) and c) is that the secondary conditioning feature SPEAKER is more local to the number node than b) and c) in the TAM node. In fact, it is immediately adjacent. Therefore, we could be seeing a preference for a more local or adjacent feature over a non-adjacent feature in terms of the conditioning context. Another potential solution makes reference to the feature geometric representations of the secondary conditioning features of e), b) and c). The VI in e) could be argued to be more specific than b) and c) because on the feature geometry that represents person and number features in (7) the representation of the ADDRESSEE feature requires three nodes, while the representation of the OBLIGATIVE feature of b) and the DEONTIC feature and c) requires two nodes and one node, respectively.<sup>12</sup> In that way, the VI in e) could be construed as the more highly specified and therefore the candidate chosen by the Subset Principle.

In sum, the Subset Principle is the main determiner of Vocabulary Insertion. In the Shiwilu data, we have seen the operation of Impoverishment at play and the necessity of feature copying. The importance of feature geometric representations has been shown to be important in determining the winning VI.

**6 Conclusion.** Throughout the course of this paper, we have accomplished an introduction to Distributed Morphology, a decomposition of the complex Shiwilu paradigms, an analysis of the

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<sup>12</sup> Thanks to Heidi Harley for pointing out this solution.

Shiwilu data in terms of Distributed Morphology, and a look into the multifaceted relationship between the Subset Principle, the Impoverishment operation with feature copying and feature geometries. Some interesting directions for further research have come to light throughout the analysis of the Shiwilu data. One avenue for further research is the directionality of conditioning of allomorphy. Another avenue for further research is to answer the question of which solution to Vocabulary Insertion in (33) is the desired solution, syntactic locality or feature geometric representations. These are interesting questions that have come to light through this study.

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