Title: A Feature-Geometric Approach to Amharic Verb Classes

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1 Introduction

It is well-known that Ethiopian Semitic languages have different verb classes which determine root shape in different paradigms. Thus verbal roots with three consonants (called "triradicals" in the Semitistic literature) in Amharic are traditionally divided into three classes, A, B, and C which differ by the vowel and gemination patterns in different paradigms. In type A roots the medial consonant geminates only in the perfect, in type C roots in the perfect and the imperfect, and in type B roots there is gemination throughout all paradigms (**säbbära**, 'break'; **fällägä**, 'seek, want'; **marräkä**, 'take prisoner' affixes are in grey):[1]

(1) **Verb Classes for Triradicals**

	Type A	**Type B**	**Type C**
Perfect	säbbärä	fällägä	marräkä
Imperfect	yəsäbər	yəfälləg	yəmarrək
Participle	säbari	fällagi	maraki

Class C verbs also differ from the other two classes by using the vowel **a** instead of **ä** after the second-to last radical. The same difference can be observed with quadriradicals (roots with four consonants), which are usually divided into two classes (type 1 and type 2), where type 2 roots take **a** after the second-to-last radical in most paradigms while type 1 roots do not (**mäsäkkärä**, 'testify'; **däballäqä**, 'mix'):

(2) **Verb Classes for Quadriradicals**

	Type 1	**Type 2**
Perfect	mäsäkkärä	däballäqä
Imperfect	yəmäsäkkər	yədäballəq
Participle	mäskari	däbalaqi

Crucially, verb classes cannot be completely reduced to syntactic, semantic or phonological features of the respective roots. While it could be assumed that constant gemination of type B verbs corresponds to an underlying phonological feature of these roots, this is not true for

[1] All forms except the participle are 3rd person singular masculine forms. All Amharic data, the basic verb classification and the Amharic orthography in this paper are taken from Leslau (1995, 2000). **ä** is a central mid vowel, **ə** a central high vowel, and **a** a central low vowel.

gemination in specific morphological contexts such as for all the other verb classes. For example, it is unlikely that the restriction of gemination to the perfect in type A roots is due to a phonological feature of these roots. The fact that the inflectional class of Amharic verb roots is not predictable has been stated e.g. by Leslau (2000) as follows (see also Bender and Fulass, 1978; Amberber, 2002):

(3) "There are three types of triradicals: type A, type B, and type C. These types are conditioned neither by the nature of the consonants nor by the meanings of the verb. Indeed, verbs in any of these types may be active, transitive, verbs of state and so on, and may consist of any kind of consonants. The types are therefore to be considered lexical items." (Leslau, 2000:57)

In this paper, I show in a line with Mueller's (2003) analysis of noun classes in Russian that Amharic verb classes have a fine-grained internal structure, and must be decomposed in different, more basic diacritic features. These features correspond roughly to properties like "gemination in the perfect" or "**a** after the penultimate root consonant", which characterize together traditional verb classes (e.g. "A, B, C" for triradical and "1, 2" for quadriradical verbs). I argue that class features are organized in a feature-geometric tree as has been proposed for pronominal features in Harley and Ritter (2003). Both assumptions are important to account for the phenomenon of class syncretism which is a pervasive feature of Amharic inflection. Thus, in the so-called **as-**derivation the distinction between type A and type B verbs collapses and both types assume the gemination pattern of type B (**näggärä**, 'tell', affixes are omitted here and in the following tables):

(4) **Class Syncretism in *as*-Stems**

	Type A/B		**Type C**
Perfect	nä**gg**är	fä**ll**äg	marräk
Imperfect	nä**gg**ər	fä**ll**əg	marrək
Participle	nä**gg**ar	fä**ll**agi	marak

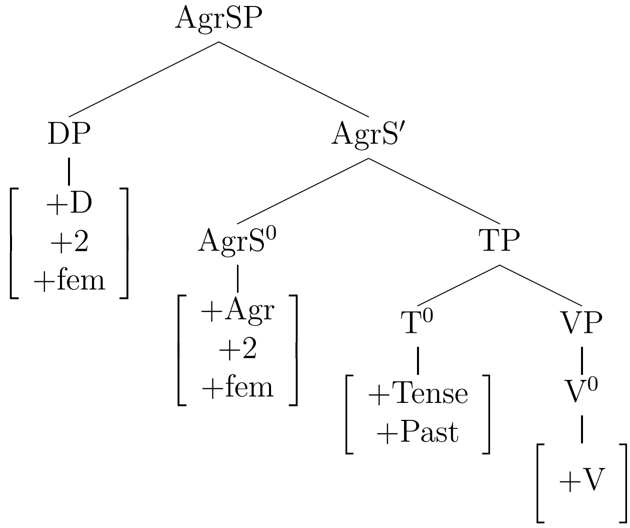
Assuming that syncretism generally follows from impoverishment, i.e. feature deletion, this means that the diacritic features of type A roots form a superset of those of type B roots, and **as-**derivation triggers deletion of the features which are specific for type A. This entails necessarily that class features for specific verb classes can be decomposed. I will show below that the unidirectionality of class syncretisms in Amharic verb inflection follows straightforwardly from the assumed feature geometry.

The remainder of this paper is structured as follows: In section 2, I introduce Minimalist Distributed Morphology, the formal framework I will assume throughout. I lay out my proposal for the decomposition of verb class features for Amharic in section 3 and show how they are organized in a feature-geometric tree in section 4. After demonstrating that this geometry derives important restrictions on possible verb classes in the language, section 5 shows that it makes possible a simple analysis of class syncretism in terms of impoverishment operations. Finally, section 6 compares the feature-geometric approach with an alternative one using unordered feature bundles and contains a short summary of the paper.

2 The Framework: Minimalist Distributed Morphology

The framework I adopt in this paper is Minimalist Distributed Morphology (MDM, Trommer (1999, 2003a,b)). In MDM, as in standard Distributed Morphology (DM, Halle and Marantz (1993)), morphology interprets the output of syntax which operates on abstract feature bundles ("heads") without phonological content. Thus the Amharic sentence *anči tə-fälləg-i* 'you (fem. sg.) wish' is represented syntactically as follows:

(5) **Syntactic Structure of *anči tə-fälləg-i* 'you (fem. sg.) wish'**



At morphological structure (MS), so-called vocabulary items (VIs), pairing underspecified morphosyntactic features with phonological content are inserted into heads. Crucially, each inserted vocabulary item corresponds to exactly one head. (6) lists the VIs to be inserted in (5) to result in *anč-i təfälləgi*. Into the verb node **flg** is inserted, into the Agr head **tə-** and **-i**, and into the D head **ant** and **-i**.[2] The mechanisms which derive **fälləg** from the root **flg** will be discussed in detail in the following sections and will also shed light on the spellout of Tense.

(6) ant: $\begin{bmatrix} +D \\ +2 \end{bmatrix}$ -i: $\begin{bmatrix} +fem \end{bmatrix}$

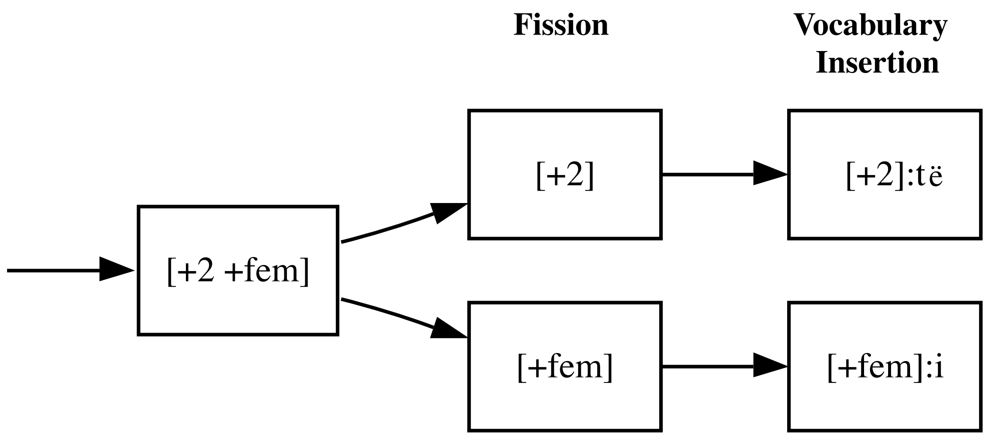
tə-: $\begin{bmatrix} +Agr \\ +2 \end{bmatrix}$ flg: $\begin{bmatrix} +V \end{bmatrix}$

While standard DM assumes a great wealth of operations which manipulate the output of syntax before vocabulary insertion, in MDM vocabulary insertion apart from morphophonology is the *only* morphological operation. Systematic neutralization and "splitting" of syntactic heads into different affixes (VIs) which require separate rule formats in standard DM are captured as the by-product of vocabulary insertion itself. Formally, vocabulary insertion in MDM involves two conceptually virtually inescapable aspects of spell-out: Syntactic features specified in the VI are deleted from the targeted syntactic head and the phonological representation is concatenated with the corresponding stem. With Halle (1997), I assume that more than one VI can be inserted into one syntactic head as long as the head still has undeleted features. Thus, as the form **tə-säbr-i** shows, in Amharic the feminine feature in 2sg forms is expressed by an affix

[2] Concatenation of **ant** and **i** leads to palatalization of **t**.

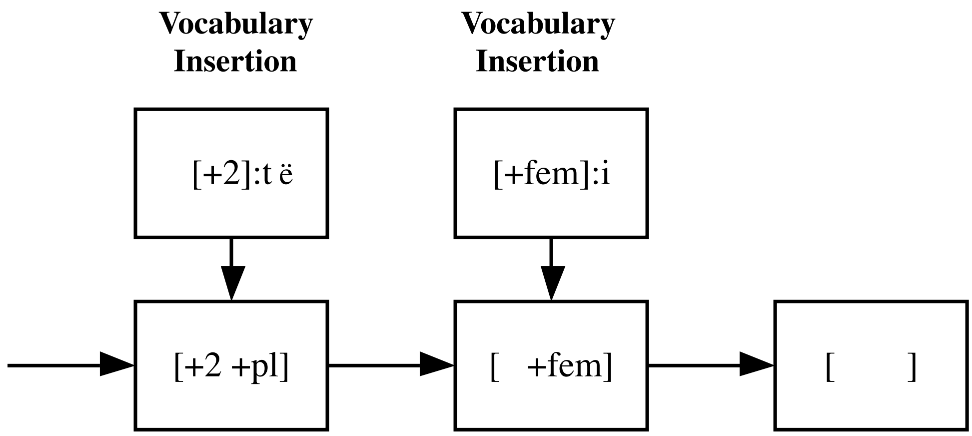
(-*i*:[+fem] separate from the person affix (*tə*-:[+2]). Data like this are expressed in classical DM by a fission operation which distributes the underlying heads into two partial heads and subsequent vocabulary insertion in the resulting positions:

(7) **Fission and Vocabulary Insertion in Classical DM**



In MDM, fission is superfluous. Insertion of tə:[+2] deletes the 2nd person feature and still allows insertion of i:[+fem] into the remaining feminine feature. At this point vocabulary insertion halts since there are no features left to trigger insertion:

(8) **Fission and Vocabulary Insertion in Minimalist DM**



Syncretism is captured by insertion of VIs which are phonologically zero. Take as an example the gender distinction in Amharic imperfect forms which leads to different forms for masculine and feminine subjects in the 2nd and 3rd person singular, but which is syncretized in the plural (**yə-säbər** , 'he breaks'):

(9) **Gender Syncretism in Amharic Imperfect Forms**

	Singular	**Plural**
1. sg.	ə-säbər	ənnə-säbər
2. sg. fem	tə-säbr-i	tə-säbr-u
2. sg. masc	tə-säbər	
3. sg. fem	tə-säbər	yə-säbr-u
3. sg. masc	yə-säbər	

In classical DM, syncretisms of this type are usually captured by impoverishment rules such as (10) which deletes feminine features in the context of plural agreement. Since impoverishment generally precedes vocabulary insertion, the syntactic feature specification [+fem] is invisible to insertion and -i: $\begin{bmatrix} \text{+fem} \end{bmatrix}$ is never inserted in plural forms:

(10) [+/–fem] → Ø / [__ +pl]

MDM maintains that syncretism results from feature deletion, but denies the existence of a separate rule format to derive it. Instead data of this type are captured by insertion of VIs with zero phonology. (10) is thus replaced by (11):

(11) Ø: $\begin{bmatrix} \text{+fem} \end{bmatrix}$ / [__ +pl]

Since non-zero VIs also allow context restrictions in DM (classical and minimalist), it implies no additional machinery to use them for zero VIs. That (11) is inserted before -i: $\begin{bmatrix} \text{+fem} \end{bmatrix}$ follows from the general principle that more specific VIs are inserted before less specific ones which is a basic tenet of DM (see section 4.1 for discussion). Note finally that zero vocabulary insertion again allows subsequent insertion of non-zero VIs if this spells out features which have not been deleted. Hence insertion of tə-: $\begin{bmatrix} \text{+Agr} \\ \text{+2} \end{bmatrix}$ can and actually must follow insertion of (11).

3 Decomposing Verb Classes

Class syncretisms similar to the ones observed in Amharic also occur in the noun inflection of Russian. Müller (2003a,b) observes that syncretism in case endings in Russian occurs both inside single noun classes and across these classes. Thus, while **-oj** is restricted to class III nouns, **-i** occurs in specific contexts with both, class II and class III:

(12) **Case Syncretism in Russian**

	I	II	III	IV
nom	Ø	a	Ø	o
acc	Ø/a	u	Ø	o
dat	u	e	i	u
gen	a	i	i	a
inst	om	oj	ju	om
loc	e	e	i	e

To capture the fact that **-i** is not restricted to a specific class, Müller proposes to decompose the noun classes by the features $+/-\alpha$ and $+/-\beta$ as follows:

(13) **Russian Noun Classes Decomposed**

I	$[+\alpha - \beta]$
II	$[-\alpha + \beta]$
III	$[-\alpha - \beta]$
IV	$[+\alpha + \beta]$

The VIs in (14) now correctly capture the class restrictions for the markers **-i** and **-oj** . Restricting an affix to a single class is still possible as in the case of the full feature specification for **-oj**, but crucially an adequate characterization for the class distribution of **-i** is only possible by underspecification which is based on the decomposition of classes into atomic features:

(14) **Vocabulary Items for Russian**

a. oj:$[-\alpha - \beta \ldots]$
b. i:$[-\alpha \ldots]$

In the following, I will show that a decomposition approach reveals crucial aspects of the verb class system of Amharic. Let us first review the distribution of gemination in triradicals and quadriradicals. The tables in (15) and (16) summarize the distribution of gemination for the penultimate root consonants from the data in (1) and (2):

(15) **Gemination in Triradicals**

	Type A	**Type B**	**Type C**
Perfect	Gemination	Gemination	Gemination
Imperfect	No Gemination	Gemination	Gemination
Participle	No Gemination	Gemination	No Gemination

(16) **Gemination in Quadriradicals**

	Type 1	Type 2
Perfect	Gemination	Gemination
Imperfect	Gemination	Gemination
Participle	No Gemination	No Gemination

Interestingly enough, the five verb classes have only three distinct distributions of gemination. Type C, type 1 and type 2 all have gemination in the perfect and imperfect, but not in the other paradigms. This observation can be captured by assigning class features which correspond to the distribution of gemination: **1** is the class feature of roots having gemination only in the perfect, **all** characterizes roots with gemination throughout, and **2** is assigned to roots with gemination in perfect and imperfect. (17) illustrates this with a slightly bigger range of forms:

(17) **Gemination Classes**

	Type A	Type B	Type 1	Type 2	Type C/
Perfect	s bb r	f ll g	m s kk r	m rr k	d b ll q
Imperfect	s b r	f ll g	m s kk r	m rr k	d b ll q
Imperative	s b r	f ll g	m s k r	m r k	d b l q
Gerund	s b r	f ll g	m s k r	m r k	d b l q
Participle	s b r	f ll g	m s k r	m r k	d b l q
Verbal Noun	s b r	f ll g	m s k r	m r k	d b l q
Gemination Class	1	all	2		

While gemination classes **1** and **all** seem to be restricted to verb types A and B respectively, as we have seen above at least gemination class **all** also extends to other verbs in cases of class syncretism. Note that the names for gemination class features are memnonic, but in principle arbitrary, and could be replaced by more neutral designators (such as α and β in Müllers analysis of Russian). While the morphological realization of all three features is related to gemination, they are diacritic features and none of them (except perhaps **all**) can be equated with a specific phonological realization throughout different paradigms.

That specific patterns crossclassify the traditional verb classes holds also true for vowel patterns. (18) and (19) show the distribution of the vowel preceding the second to last root consonant across different verb classes for tri- and quadriradicals. Type C and type 2 roots have consistently **a** in this position while types A, B and 1 have **ä** if the following root consonant is geminated, and otherwise either **ä**, **ə** or no vowel at all:

(18) **Class**

	Type A	**Type B**	**Type 1**	**Type C**	**Type 2**
Perfect	s**ä**bbär	f**ä**lläg	mäs**ä**kkär	m**a**rräk	d b**a**lläq
Imperfect	säb r	f**ä**lləg	mäs**ä**kkər	m**a**rrək	d b**a**lləq
Imperative	səb är	f**ä**lləg	mäs k ər	m**a**r k	d b**a**l q
Gerund	säb r	f**ä**lləg	mäs k ər	m**a**r k	d b**a**l q
Participle	säb ar	f**ä**llag	mäs k ar	m**a**r ak	d b**a**l aq
Verbal Noun	səb är	f**ä**lläg	mäs k är	m**a**r äk	d b**a**l äq
Vowel Class	ä			a	

I will show in section 4.2 that the different distributions of vowels in classes A/B/1 in this position is due to an complex interplay of different morphological processes and phonological epenthesis. What is of importance here is that all verb classes fall in one of two more general vowel classes one characterized by **ä** and one characterized by **a**. Taking the subclassifications for gemination and vowels together now each of the traditional verb classes can be defined as the combination of a specific gemination class with a specific vowel class and the radical number as follows:

(19) **Vowel Classes Decomposed**

	Type A	**Type B**	**Type 1**	**Type C**	**Type 2**
Gemination Class	1	all	2	2	2
Vowel Class	ä	ä	ä	a	a
Radical Number	3	3	4	3	4

However, not all combinations of vowel and gemination classes correspond to an existing verb class. Thus, there are no verbs (and hence no corresponding verb classes) which geminate only in the perfect (as type A) or throughout their paradigms (as type B) and have the characteristic **a-** vowel of vowel class **a**. This gap is indicated by "*" in (20):

(20) **(Non-)Coocurrence of Decomposed Classes**

Gemination Class	**Vowel Class**	
	ä	a
1	Type A	*
All	Type B	
2	Type 1	Type C Type 2

Similarly, not all combinations of vowel and gemination class combine with both numbers of radicals (3 and 4). Actually only the combination **2/a** occurs with 3 and 4 radicals (resulting in verb classes C and 2), but other combinations are restricted either to triradicals or to quadriradicals:

(21) **Vowel Classes Decomposed**

Gemination/Vowel Class	**1/ä**	**all/ä**	**2/ä**	**2/a**
3 Radicals	Type A	Type B	*	Type C
4 Radicals	*	3	Type 1	Type 2

In section 4, I will show that both types of restrictions follow from the combination of a feature-geometric representation for vowel class and gemination class features and impoverishment rules.

4 The Feature Geometry of Verb Classes

Structuring features in hierarchical trees has a long tradition in generative phonology (cf. Clements, 1985; Sagey, 1986). Harley and Ritter (2002) show that a similar geometry of features is also able to capture important crosslinguistic generalizations if applied to morphosyntactic features (cf. also Bonet, 1991; Nevins, 2003; Trommer, 2003a). More specifically, they propose a geometry for person and number features which is here exemplified by the representations for the number features singular, plural, and dual:

(22) **Feature Geometry in Morphosyntax (Number, Harley and Ritter, 2002)**

singular
Ind(ividuation)
min(imal)

plural
Ind(ividuation)
group

dual
Ind(ividuation)
group min(imal)

The fact that dual is represented by conjoining the features characteristic for singular and plural allows a simple account of the fact that languages which have a grammaticalized plural category also have a singular/plural distinction (Greenbergs universal 34; Greenberg, 1963:94). In the context of Minimalist Distributed Morphology, this geometry predicts strong restrictions on possible syncretisms. Thus, as argued in Trommer (2003a), this geometry allows for syncretisms of dual to plural or singular, but not for syncretisms where singular levels to plural forms. This follows if all syncretism is caused by impoverishment, i.e. zero VIs causing deletion of features. Hence syncretism can be caused by transforming the structure for dual into the one for singular as in (23), but the converse derivation in (23) which would involve feature insertion is excluded:[3]

(23) **Dual ➔ Singular Syncretism (Possible)**

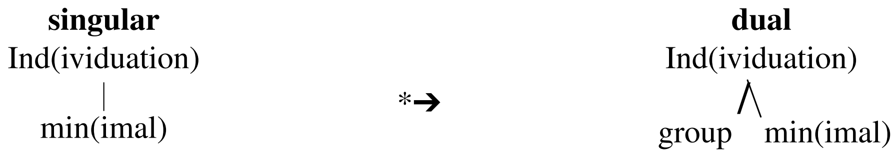
dual
Ind(ividuation)
group min(imal)

➔

singular
Ind(ividuation)
min(imal)

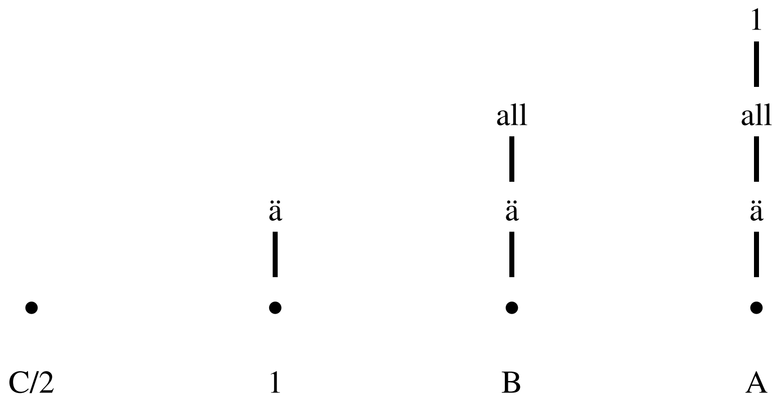
[3]The argument is slightly more intricate since underspecified vocabulary items must be taken into account. See Trommer (2003a) for details.

(24) **Singular ➔ Dual Syncretism (Excluded)**



While Harley and Ritter (2002) argue that the features for person and number and their geometrical organization are universal[4] I will show that the feature-geometric approach is also crucial for an account of language-specific and more specifically diacritic class features. In particular, I will argue that the gemination and vowel class features introduced in section 3 are structured as in (25):

(25) **Distinguishing Verb Classes Geometrically**

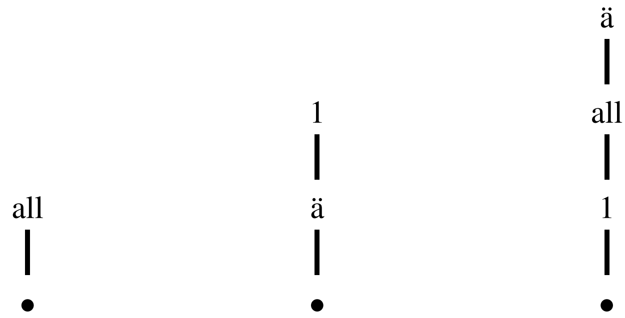


Note that the trees in (25) and in the following are depicted bottom-up not upside down as in the preceding examples since this allows a more transparent representation of derivations involving feature deletion. The traditional class names (1, 2, A, B, and C) are added for expository convenience, but are not part of the tree structures, and in fact do not have any theoretical status in the analysis. The bullet ("•") represents the root node of the class features which links them to other morphosyntactic features of roots. It might be identified with a specific root feature, but I will remain agnostic on this question here.

Now assuming that every node in a geometry is restricted to a single node which can immediately dominate it, i.e. cannot be immediately dominated by any other node (e.g. **all** must always be dominated by **ä** and **ä** must always be dominated by the root node), this geometry by itself restricts the possible verb classes of Amharic to four. In other words assuming the same features and the same conditions on immediate dominance no other representations are possible. Structures as the ones in (26) are excluded since single nodes are immediately dominated by inappropriate mother nodes:

[4]Parametrization among different feature systems in single languages is due the fact that not all languages use all features in all combinations and certain categories (e.g) singular might be represented by underspecified feature geometries.

(26) **Excluded Class Representations**



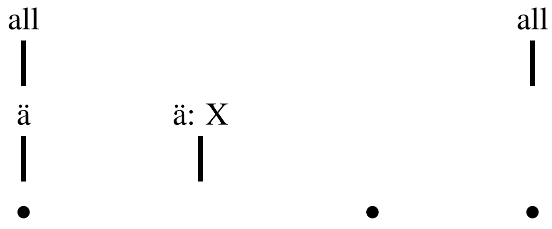
In the following two subsections, I will discuss how gemination and vowel patterns are derived by different VIs realizing class features through consonant gemination or vocalic features.

4.1 Deriving Gemination Patterns

I will assume that gemination or non-gemination of the penultimate root consonant is triggered by VIs specified for autosegmental skeleton structures, which are associated at vocabulary insertion with the melodic content of the penultimate root consonant. Hence these vocabulary items either specify CC (for gemination) or C for non-gemination.

I assume further that association of a specific segment happens only once during the derivation. For example if one vocabulary item has associated the penultimate consonant with C, insertion of a following VI specifying CC will have no visible phonological effect. Vocabulary Insertion deletes, i.e. delinks the morphosyntactic features the inserted VI specifies. Following standard assumptions of autosegmental phonology and morphology (Goldsmith, 1990; Bonet, 1991; Nevins, 2003), delinking of a feature **F** automatically also delinks all features which are dominated by **F**. Thus inserting the hypothetical VI (27b) into the tree (27a) results in (27c) (the bare root node) not in (27d):

(27) **Autosegmental Conditioning of Vocabulary Insertion**



a. b. c. d.

(28) now shows all VIs (G1-G3) which are responsible for gemination patterns in Amharic verbs and two default statements for the penultimate root consonants (D1 and D2) , which govern gemination if none of the VIs is inserted:

(28) **Gemination Patterns by Vocabulary Items**

G1	**G2**	**G3**
1 | all : C / ___ Imperfect |	1 | all : Ø |	all | : CC

D1	**D2**
CC / ___ (Im)Perfect	C

G3 is responsible for consistent gemination of type B roots which have **all** as the highest node of the feature tree. D1 ensures that in the default case imperfect and perfect forms have gemination. That type A verbs are exceptional to the latter pattern in the imperfect is ensured by G1 which associates the penultimate root consonant with C before D1 can be applied. G2 has the effect that type A verbs in all remaining verb paradigms participate in the default patterns. Which VI is inserted first is determined by the three principles listed in (29):

(29) a. VIs associated with lower syntactic domains
are inserted before VIs associated with higher syntactic domain
b. VIs targeting less embedded features
are inserted before VIs targeting more embedded features
c. More specific VIs are inserted before less specific VIs

VIs can be associated to three domains, the root, vP, or CP, i.e. the root alone and the strong phases in the sense of Chomsky (2001). All VIs in (28) belong to the CP domain, but we will see later VIs which are linked to one of the other two domains. Crucially VIs can spell out features from a lower syntactic domain (if this has not happened in that domain), but their context cannot be restricted by features already spelled out in the lower domain. (29b) for example would prefer insertion of the hypothetic VI in (30) over G3 because (30) targets the less embedded feature **1** :

(30) **Hypothetical VI:** 1
 \| : X

Finally, (29c) prefers insertion of VIs which are more specific either because they specify more features or because they have a context restriction. Thus G1 is prefered over G2 because while everything else is equal, G1 has a context restriction and G2 has none. Similarly G2 is prefered over G3 since it specifies two features while G3 specifies only one. The principles in (29) are ordered in the sense that if they contradict each other (30a) has precedence over (30b) and (30c) and (30b) has precedence over (30c). We will see examples for this point in later sections, but for the VIs introduced so far the principles converge. For example G2 is more specific than G3, but also targets a higher feature.

Let us now turn to concrete derivations. I will discuss derivations for type A, B and C. Types 1 and 2 are crucially derived in the same way as type C. (31) shows how gemination in representative forms of type B verbs is derived. The penultimate consonant is represented by **b**, the preceding vowel by **V**. G1 and G2 do not match the initial class representation of these verbs which do not contain the feature **1**. Therefore the first VI matching in all 3 forms is G3 which deletes the feature **all** and associates the penultimate consonant with gemination (CC). Since association for a given segment happens only once no further VI has any effect on these forms and we get consistent gemination:

(31) **Deriving Type-B Stems**

		G1	G2	G3	D1	D2	
	V b	—	—	~~all~~ CC ∨ V b			**Perfect**
all ä •	V b	—	—	~~all~~ CC ∨ V b			**Imperfect**
	V b	—	—	~~all~~ CC ∨ V b			**Participle**

Type-C roots are maximally underspecified for class features, hence G1, G2 and G3 do not match them. Gemination is governed by the default statements resulting in gemination by D1 in the context of perfect and imperfect. In all other forms such as the participle, D2 applies and we get C, i.e. no gemination:

(32) **Deriving Gemination in Type-C Stems**

		G1	G2	G3	D1	D2	
	V b	—	—	—	CC ∨ V b		**Perfect**
•	V b	—	—	—	CC ∨ V b		**Imperfect**
	V b	—	—	—		C | V b	**Participle**

The most complex derivations arise with type A roots. In the non-imperfect forms, G2 is inserted and deletes **1** and **all**, but since its phonological content is zero, there is no association with the penultimate root consonant and in the perfect D1 applies leading to gemination while in other non-imperfect forms such as the participle D2 results in non-gemination. G1 bleeds G2 for the imperfect form. Since G1 introduces a non-zero consonantal pattern, no further phonological effect of other VIs or default statements encoding the penultimate consonant is possible:

(33) **Deriving Gemination for Type-A Stems**

		G1	G2	G3	D1	D2	
1	V b	—	~~1 all~~	—	CC ⋁ V b		**Perfect**
all ä	V b	~~1 all~~ C | V b					**Imperfect**
•	V b	—	~~1 all~~	—	—	C | V b	**Participle**

4.2 Deriving Vowel Patterns

A specific complication with vowel patterns consists in the fact that, except by root class, vowels interspersed between the root are also partially governed by Tense, the category label of verbs and purely phonological vowel epenthesis. Let us consider each of these factors in turn. (34) contains again representative stem forms for all relevant classes. The vowels for each root column are aligned (resulting in spaces without significance) to enease comparison of vowels in corresponding positions:

(34) **Vowel Classes**

	Type A	**Type B**	**Type 1**	**Type C**	**Type 2**
Perfect	säbbär	fälläg	mäsäkkär	marräk	däballäq
Imperfect	säb r	fäll**ë**g	mäsäkk**ë**r	marr**ë**k	däball**ë**q
Imperative	səb är	fäll**ë**g	mäs k **ë**r	mar k	däbal q
Gerund	säb r	fäll**ë**g	mäs k **ë**r	mar k	däbal q
Participle	säb ar	fällag	mäs k ar	mar ak	däbal aq
Verbal Noun	səb är	fälläg	mäs k är	mar äk	däbal äq

Crucially, the last vowel of the stem can be almost completely predicted from Tense/aspect (or related categories as non-finiteness in participles). All perfect forms have **ä** in their last position, all participle forms **a** and all imperative forms either no vowel or **ə** after a geminate which is obviously phonologically conditioned. I will therefore assume that – apart from phonological epenthesis – the last verbal stem vowel in Amharic is always the spellout of the Tense/aspect head. The only exception to the generalization that the last vowel is the same for a given Tense/aspect across verb classes are the type-A forms in the imperative and the verbal noun. I assume that in these cases Tense is expressed by specific allomorphs (more specific VIs restricted to the context of type A, i.e. **1 - all - ä- a**). Note that it is predicted by the feature-geometric approach that type A should be the locus of idiosyncratic allomorphy. If an allomorph were restricted to **all - ä** or to **ä** this would include type B, but also other classes. This type of allomorphy also provides evidence that spellout of Tense happens before spellout of class features since if the opposite were true the features characteristic for type A would be deleted before spellout of Tense, and hence be invisible for allomorphy of Tense. I will assume that Tense spellout actually applies to bare roots resulting in the derivations shown in (35) with the vowels inserted by Tense spellout in boldface:

(35) **Tense**

	Type A	**Type B**	**Type 1**	**Type C**	**Type 2**
Perfect	s b **är**	f l **äg**	m säk **är**	m rr**äk**	d b l **äq**
Imperfect	s b r	f l g	m säkk r	m rr k	d b l q
Imperative	səb **är**	f l g	m s k r	m r k	d b l q
Gerund	s b r	f l g	m s k r	m r k	d b l q
Participle	s b **ar**	f l **ag**	m s k **ar**	m r **ak**	d b l **aq**
Verbal Noun	səb **är**	f l **äg**	m s k **är**	m r **äk**	d b l **äq**

Spellout of class features follows spellout of Tense. Due to the principle in (29-b) which has the effect that deeper embedded features are spelled out after less embedded features, VIs for gemination class features apply before VIs for vowel class features. (36) summarizes the effects of the derivations discussed in 4.1 on the stems in (35):

(36) **Gemination Class Features**

	Type A	**Type B**	**Type 1**	**Type C**	**Type 2**
Perfect	s bb**är**	f ll**äg**	m säk **är**	m rr**äk**	d b ll**äq**
Imperfect	s b r	f ll g	m säkk r	m rr k	d b ll q
Imperative	səb **är**	f ll g	m s k r	m r k	d b l q
Gerund	s b r	f ll g	m s k r	m r k	d b l q
Participle	s b **ar**	f ll**ag**	m s k **ar**	m r **ak**	d b l **aq**
Verbal Noun	səb **är**	f ll**äg**	m s k **är**	m r **äk**	d b l **äq**

As we have seen above, type C and type 2 verbs have **a** (hence vowel class **a**) in the second to last vowel position while all other types have **ä** (hence vowel class **ä**) if the following root consonant is geminated (we will see below why **ä** occurs also before some non-geminated penultimate root consonants). That the spellout of vowel class features presupposes information on gemination of the following consonant provides further evidence that the derivation of gemination precedes the determination of vowel patterns which follows crucially from the deeper embedding of vowel class features in the geometry.[5] (37) shows the effect I assume for the spellout of vowel class features, **a** for class **a** and **ä** before geminates in class **ä** roots.

[5]Note that gemination does not correspond one by one to any of the atomic or composed verb classes. Thus the context dependency of vowel realization in this case seems to be truly phonological.

(37) **Class**

	Type A	**Type B**	**Type 1**	**Type C**	**Type 2**
Perfect	säbbär	fälläg	m säkkär	m**a**rräk	d b**a**lläq
Imperfect	s b r	fäll g	m säkk r	m**a**rr k	d b**a**ll q
Imperative	səb är	fäll g	m s k r	m**a**r k	d b**a**l q
Gerund	s b r	fäll g	m s k r	m**a**r k	d b**a**l q
Participle	s b ar	fällag	m s k ar	m**a**r ak	d b**a**l aq
Verbal Noun	səb är	fälläg	m s k är	m**a**r äk	d b**a**l äq

Finally, all verb classes show occurrence of **ä** in the position after the first root consonant if this is not already filled by another category as by Tense in the type A imperative or the class vowel **a** as in all type C roots. I will assume that **ä** here is the spellout of the categorial head, little v which dominates all verb roots:

(38) **v**

	Type A	**Type B**	**Type 1**	**Type C**	**Type 2**
Perfect	säbbär	fälläg	m**ä**säkkär	marräk	d**ä**balläq
Imperfect	s**ä**b r	fäll g	m**ä**säkk r	marr k	d**ä**ball q
Imperative	səb är	fäll g	m**ä**s k r	mar k	d**ä**bal q
Gerund	s**ä**b r	fäll g	m**ä**s k r	mar k	d**ä**bal q
Participle	s**ä**b ar	fällag	m**ä**s k ar	mar ak	d**ä**bal aq
Verbal Noun	səb är	fälläg	m**ä**s k är	mar äk	d**ä**bal äq

Under the assumption that as with gemination, insertion of vowels into the root is feature filling, hence cannot replace previously inserted vowels, this follows naturally if spellout of little v occurs after the spellout of class and Tense. Taken together the whole derivation implies the hierarchical order Tense > Class > v which also corresponds to the linear order of the root vowels. Tense vowels are final, class vowels roughly medial, and vowels corresponding to little v initial. Importantly this order is the mirror image of the structure of verbs proposed for verbs in Romance languages by Oltra-Massuet (1999) and Oltra-Massuet and Arregi (2005)[6] suggesting that there are principled syntactic reasons for the ordering of root vowels:

(39) a. **Amharic:** Tense > Class > v
b. **Romance:** v> Class > Tense

Finally, in specific positions epenthetic **ə** is inserted, especially after geminate consonants, but optionally also in specific other positions as in the imperfect form **säbr** which can optionally be realized as **säbər**. (40) shows the cases of obligatory **ə-**epenthesis:

[6]These authors treat the position I term "Class" as Theme. However in their analysis the theme position expresses – by contextual allomorphy – almost exclusively class features of the verb. A further difference to my analysis here is that they assume for Romance additional theme positions following other functional heads (e.g. Tense).

(40) **ə-Epenthesis**

	Type A	Type B	Type 1	Type C	Type 2
Perfect	säbbär	fälläg	mäsäkkär	marräk	däballäq
Imperfect	säb r	fällëg	mäsäkkër	marrëk	däballëq
Imperative	səb är	fällëg	mäs k ër	mar k	däbal q
Gerund	säb r	fällëg	mäs k ër	mar k	däbal q
Participle	säb ar	fällag	mäs k ar	mar ak	däbal aq
Verbal Noun	səb är	fälläg	mäs k är	mar äk	däbal äq

Let us now return to the spellout of the vowel class features themselves. I assume that this is due to the three VIs in (41). Note that V1 is restricted to the context of penultimate root geminates:

(41) **Vowel Patterns by Vocabulary Items**

V1	**V2**	**V3**
ä | : ä / CC •	ä | : Ø •	•: a

After the spellout of gemination class features, type A and type B roots have the same feature structures (• dominated by **ä**). Hence the only distinction which is relevant in both classes is the (non-)presence of a root geminate. If a geminate is present in this position, V1 is inserted, otherwise V2. Since both VIs are more specific and target a less embedded feature, they bleed insertion of V3, which is only inserted in the maximally underspecified type C/2 structures:

(42) **Deriving Class Vowels**

		V1	**V2**	**V3**	
ä | •	V bb	~~•—ä~~ ä | V b b			**Type A/B with Gemination**
ä | •	V b	—	~~•—ä~~ ä | V b		**Type A without Gemination**
•	V b	—	—	~~•~~ a | V b(b)	**Type C**

4.3 Explaining Coocurrence Restrictions

Recall that there are substantial restrictions on the coocurrence of vowel and gemination patterns, but also on the possible combinations of root class and the number of root consonants.

The first of these restrictions already follows from the analysis proposed so far: The fact that roots with gemination patterns **1** and **all** never have vowel pattern **a** follows from the fact that the VIs responsible for the spellout of these classes reduce them uniformly to the structure **ä** – **•**, and as we saw the VIs for vowel class feature realize this structure as **ä** bleeding realization as **a**.

Since neither the feature geometry nor the VIs so far make any reference to radical number, the coocurrence restrictions which treat triradicals and quadriradicals differently still remain to be accounted for. Impoverishment implemented by insertion of zero VIs accounts straightforwardly for these facts. Recall from section 3 that there are no quadriradicals which behave like type A triradicals in showing only gemination in the perfect. Similarly, there are no triradicals which have gemination in the perfect and imperfect, and the **ä** vowel pattern, while there is a root class which has just these properties in quadriradicals (class 1).

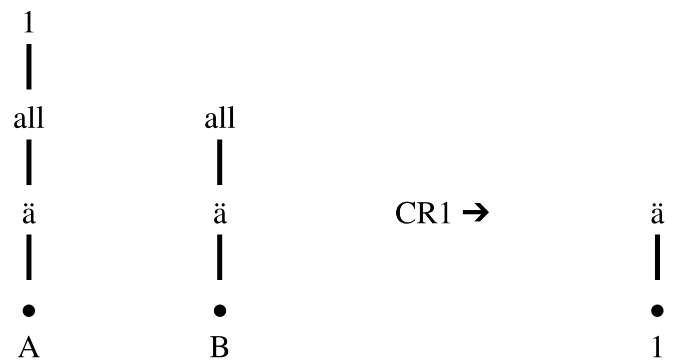
The VI in (43) is associated with the root level, and is inserted before all VIs from vP and CP level (cf. the discussion of (29-a)). It applies to all roots with four consonants and the feature specifications of (triradical) class A and B verbs While quadriradicals with these specifications are possible in the lexicon, (43) has the effect that the relevant features are deleted before any other VI is inserted.

(43) **CR1**

all
| : Ø/ ___ CCCC

The VI targets the feature **all** which by the general working of autosegmental rules leads for type A roots also to delinking of **1** which is dominated by **all**. The resulting feature structures are identical to the one characteristic of type 1 verbs. Thus on the surface, quadriradical type A and B verbs are indistinguishable from type C roots:[7]

(44) **Neutralization of Quadriradical Type A and B Roots to Type 1**



In an analogous way, triradicals of type 1 are excluded by the zero VI in (45). The bar above **ä** indicates that the VI targets only trees where **ä** is a terminal node (i.e. does not dominate anything else).[8]

[7]Of course language learners when acquiring a quadriradical root which can either be interpreted as type 2 or A/B will probably choose type 2 since this minimizes the derivational steps necessary to derive verb forms involving this root.

[8]It is also necessary to ensure that "'CCC" matches only triradicals and not three consonants in quadriradicals. This might be achieved by boundary symbols, e.g. "+CCC+".

(45) **CR2**

$\bar{}$
ä
| : Ø/ __ CCC

Since type 1 roots are characterized underlyingly by undominated **ä**, this is deleted with triradical verbs, and in this way all such roots will be reduced to the root node, hence type C. (46) summarizes how CR1 and CR2 effectively derive the observed inventory of radical number/root type combinations:

(46) **Combinations**

	Triradicals				**Quadriradicals**			
Lexical	C/2	1	A	B	C/2	1	A	B
		CR2					**CR1**	
Surfacing	C/2		A	B	C/2	1		

5 Class Syncretism as Impoverishment

As shown in section 1, in stems derived by **as-**, which express causativity, the distinction between type A and type B roots disappears and both types are inflected throughout as type B roots. The tables in (47) and (48) illustrate this case of class syncretism:

(47) **Basic Stem (Repeated)**

	Type A	**Type B**	**Type 1**	**Type C**
Perfect	nä**gg**är	fä**ll**äg	mänäzzär	marräk
Imperfect	nägər	fä**ll**əg	mänäzzər	marrək
Participle	nägar	fä**ll**ag	mänzar	marak

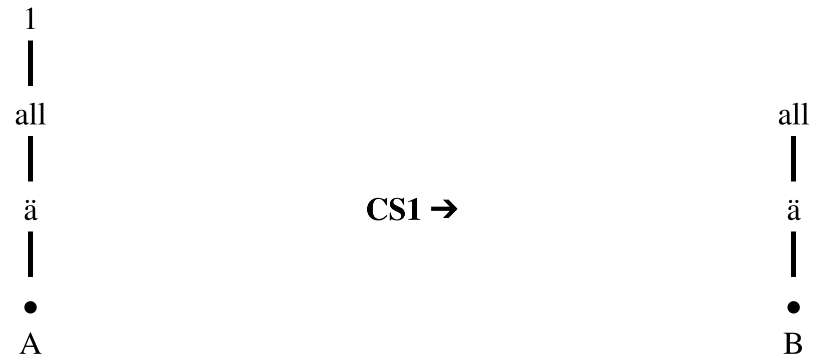
(48) ***as*-Stem**

	Type A/B		**Type 1**	**Type C**
Perfect	nä**gg**är	fä**ll**äg	mänäzzär	marräk
Imperfect	nä**gg**ər	fä**ll**əg	mänäzzər	marrək
Participle	nä**gg**ar	fä**ll**agi	mänzar	marak

The feature-geometric approach to class features gives us now an easy handle on this phenomenon. Since the features representing class B form a proper subtree of the features for type A, syncretism leveling type A to type B can be simply captured by feature deletion which in the current framework is implemented as insertion of zero VIs. The VI in (49) deletes the feature **1** in the context of an **as-** prefix and has exactly this effect as shown in (50):

(49) **CS1:** 1
| : Ø / as- __

(50) **Class Syncretism in *as*-Stems by Impoverishment**



Given the proposed feature geometry in (25), in principle any class **L** can be neutralized to one of the classes which are represented by feature trees forming proper subtrees of the one for **L**. Indeed all of these possibilities are attested in other derivational patterns of Amharic. Thus in the **at-**stem which involves prefixation of **at-** and expresses causativity of reciprocity (Leslau, 1995:486), all verb classes behave as type C or 2 roots, i.e. they exhibit **a** before the penultimate root consonant and geminate only in the perfect and imperfect as shown in (51):

(51) ***at*-Stems**

	Type A/B		**Type 1**	**Type C**
Perfect	n**agg**är	f**all**äg	män**azz**är	m**arr**äk
Imperfect	n**agg**ər	f**all**əg	män**azz**ər	m**arr**ək
Participle	n**ag**ar	f**al**agi	män**az**ar	m**ar**ak

The same class syncretism occurs in derivations formed by internal reduplication of the penultimate root consonant which expresses repetition, frequency or intensivity of action (Leslau, 1995:456). The vowel preceding the second instance of the doubled consonant is always **a**, while the penultimate root consonant itself is doubled in the perfect and imperfect and shows otherwise no gemination. Geminated triradical roots hence behave in every respect as quadriradical type 2 roots.[9]

(52) **Class Syncretism in Reduplicated Stems**

	Type A	**Type B**	**Type C**
Perfect	sä**ba**bbär	fä**la**lläg	m**är**arräk
Imperfect	sä**babb**ər	fä**la**lləg	m**är**arrək
Participle	sä**ba**bar	fä**lal**ag	m**är**arak

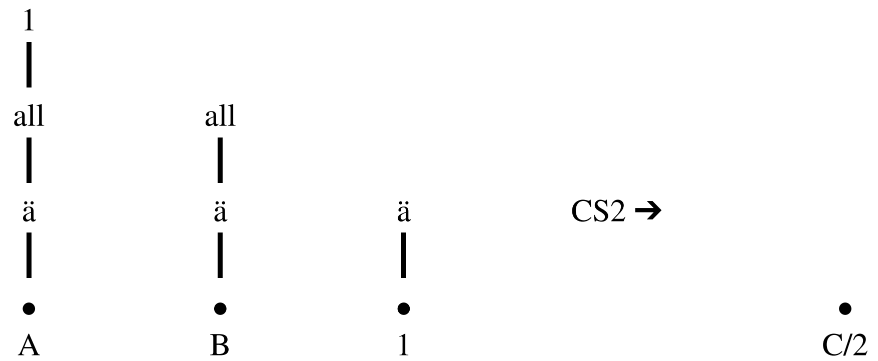
In terms of the feature geometry for class features, in both types of derivation (**at-** and frequentative), all features above the root node are deleted in the context of **at-** or the reduplicative morpheme. This can be accomplished by the VI in (53) which targets **ä**, but by the usual autosegmental delinking conventions delinks , i.e. deletes also all nodes dominated by **ä**:

[9]In Amharic only triradical roots can reduplicate in this manner. However, in related Ethiosemitic languages such as Tigre, also quadriradicals can reduplicate resulting in quinqueradicals. Interestingly these also behave as specific classes of nonderived quinqueradicals (Rose, 2003).

(53) **CS2** ä | • : Ø/ __ {at-, RED}

Hence all occurring feature structures are reduced to the bare root node:

(54) **Class Syncretism in *at*-Stems and Reduplicated Stems by Impoverishment**



Note that in order to bleed the VIs for type A verbs (G1 and G2 in (28)), CS2 has to be associated with an earlier syntactic domain than those. I will assume that all zero VIs relevant for class syncretism are assigned to the vP domain which fits well with the fact that the derivational categories which trigger them manipulate at least partly argument structure.

A third type of class syncretism is found in the **tä-**derivation which derives passive verbs. Here type A and type B verb pattern with type 1 roots in the imperfect and jussive but not in other forms such as participles,[10] i.e in imperfect and iussive they show the typical vowel distribution of class **ä**, and geminate in the imperfect, but not in the jussive:

(55) **Class Syncretism in *tä*-Stems**

	Type A	**Type B**	**Type 1**	**Type C**
Perfect	säbbär	fälläg	mäsäkkär	marräk
Imperfect	s**äbb**är	f**äll**äg	mäs**äkk**är	marräk
Jussive	sä**b**är	fä**l**äg	mäs**k**är	maräk
Participle	säbari	fällag	mäskar	maraki

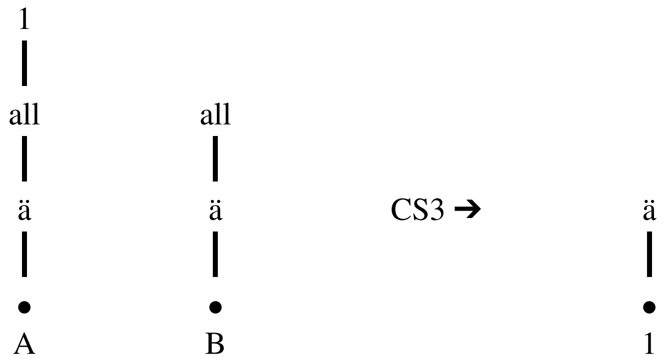
This behavior follows from the VI in (56), which is not only restricted to a specific derivational affix but also to the relevant Tense/aspect categories:

(56) **CS3** all | : Ø/ tä- __ { Impf/Juss }

(57) shows how **CS3** in effect reduces type A and type B roots to type 1:

[10]Perfect forms are geminated throughout all classes, hence that different classes share this pattern is not an indication for syncretism.

(57) **Class Syncretism in *tä*-Stems by Impoverishment**



Note that the **tä-**derivation creates (although only in a restricted part of the paradigms) triradicals which pattern like type 1 roots which was excluded in section 4.3 by **CR2**. However **CR2** applies at the root cycle i.e. before **CS3**. This has the – empirical correct – consequence that the constraint against triradical type 1 roots holds only for roots which are type 1 via lexical specification, but not for roots where this class is derived by derivational processes.

(58) summarizes now the neutralization processes occurring in Amharic root derivations:

(58) **Class Syncretisms**

A	B	1	C/2	
A ➔ B				(*as*-)
A ➔ 1				
	B ➔ 1			(*tä*-)
A ➔ C				
	B ➔ C			(*at*-)
		1 ➔ C		

Crucially, all the observed class syncretisms follow the hierarchy in (59a) in the sense that syncretism can level a verb class higher in the hierarchy to a lower one, but not the other way around. In other words syncretisms as in (59b) are excluded:

(59) a. **Hierarchy:** A > B > 1 > C/2
b. **Excluded:** B ➔ A, 1 ➔ A, 1 ➔ B, C ➔ A, C ➔ B, 1 ➔ C

This unidirectionality of class syncretism follows from the combination of feature geometry and the assumption that syncretism is always due to strictly feature-deleting zero VI insertion. Since the hierarchy in (59a) corresponds to the complexity of the feature trees in their representation, i.e. each class in (59a) is a proper subtree of the next higher class. Syncretism leveling B to A would involve inserting the feature **1** which is excluded in MDM.

6 Discussion and Summary

The analysis of class syncretism in section 5 could in principle be mimicked by a theory which uses unordered feature bundles if verb types are represented by combinations of unary features as in (60):[11]

[11] A similar analysis could be stated with binary features, but this would make the comparison more complex without changing the general points.

(60) **Unordered Feature System for Amharic Verb Types**

A	=	[1 ä all]
B	=	[ä all]
1	=	[ä]
C/2	=	[ ]

However, this approach has three serious shortcomings: First, it also predicts a number of unattested classes, namely the ones in (61):

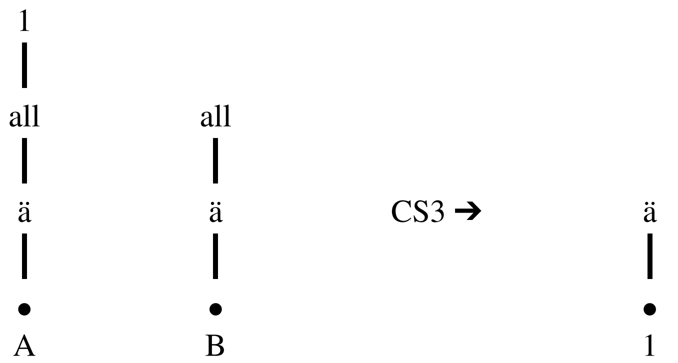
(61) **Additional verb Classes Predicted by an Unordered Feature System**

??	=	[1]
??	=	[all]
??	=	[1 all]

Second, the approach based on unordered features does not predict that gemination class features are spelled out before vowel class features. Thus nothing under such an approach blocks spellout of **ä** before spellout of **1** and **all**. However, as we have seen in section 4.2, the correct derivational order of feature types is crucial for the appropriate insertion of vowel class VIs in the context of (non-)gemination, and follows straightforwardly from general constraints on vocabulary insertion in the feature-geometric approach.

Third and most importantly, under an unordered feature approach, impoverishment cannot be captured in a natural way. Recall that with **tä**-derivation, type A and type B reduce to type 1, which I have captured by a VI referring to **all** causing also delinking of **1** if present:

(62) **Class Syncretism in *tä*-Stems by Impoverishment**



In a unary feature approach, there is no inherent reason why deletion of **all** and **1** should cooccur. This would have to be stipulated by disjunction in the VI carrying out impoverishment or by different VIs referring to the same context (the presence of **tä**). In any way, an important generalization would be missed. Similar observations hold for most of the zero VIs causing impoverishment which I have discussed in this paper.

Thus, the feature-geometric approach captures important generalizations, both on possible classes (and their derivations) and the working of class syncretisms which are not available in a system with unordered features.

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