

Multiple-Feature Mutation and Realize Morpheme

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Abstract

Wolf (2005; 2007) argues that the realization of featural affixes in mutation morphology is triggered by the constraint MAXFLT which requires that phonological material not linked to a root node (“floating features”) is fully preserved in the output. As evidence that the realization of floating features cannot be achieved by the weaker, but more general constraint REALIZE MORPHEME (van Oostendorp 2005), Wolf adduces cases where a single morphological category seems to involve mutation for multiple phonological features. In this paper, I show that the data Wolf cites are in fact morphologically complex, and exhibit well-behaved single-feature mutation under an appropriate morphological analysis. It follows that REALIZE MORPHEME fully obviates MAXFLT for mutation.

1. Introduction

In mutation morphology, a morphological category is partially or entirely expressed by changing segmental features of phonemes in the morphological base. Thus in the Bantu language Aka (Akinlabi 1996), the singular of class 5 nouns is expressed without a segmental affix by voicing the initial root:

(1) Voicing Mutation in Aka (Akinlabi 1996):

<i>Class 5 - singular</i>	<i>Class 6 Plural</i>	
gòàlà	mà-gòàlà	(game of imitation)
bèlèlé	mà-bèlèlé	‘sound of waterfall’
dzámà	mà-dzámà	‘mud’
dèŋ gé	ma-tèŋ gé	‘piercing tool’
gásá	ma-kásá	‘palm branch’
bàpùlàkà	ma-pàpùlàkà	‘lung’

Under the standard autosegmental analysis (see Lieber (1992) and references cited there), mutation is partially morphological and partially phonological. On the morphological side, it involves affixation of floating features, i.e. fea-

tures which are not associated to root nodes. On the phonological side, there are processes which integrate the floating featural material into segments of the base by associating them to adjacent root nodes. This leads to delinking of underlying features for the involved segments and hence to overwriting. Thus for Aka, we might assume that the class 5 singular morpheme is a prefix which has the structure in (2):¹

(2) [+voice] ↔ [+sing +class5]

If (2) is affixed to a noun such as **kásá**, a phonological rule associates the [+voice] of the affix to the root node of the adjacent stop **k** triggering delinking of the underlying [-voice] feature, which results in surface **gásá**. If attached to bases with initial voiced segments, overwriting applies vacuously. Assuming Richness of the Base (Prince & Smolensky 1993), it is straightforward to transfer the morphological part of Lieber's original account into an optimality-theoretic analysis since incomplete segmental material cannot be excluded from the input anyway. However under the premise that phonological constraints are general (not morpheme-specific) and universal (not language-specific), it is a non-trivial task to account for the phonological side of mutation: As already noted by Zoll (1996), standard OT-faithfulness constraints conspire to erase floating features. This is illustrated in (3) for the input [+voice]+kásá in Aka. MAX and DEP are indifferent with respect to the floating feature, while IDENT prefers retention of the feature which is underlyingly associated to the root segment. Hence we expect deletion of the floating feature (subscripted features indicate association to the root node of the respective segment, ☞ marks the winning candidate under the given ranking, and ☞ the empirically correct output candidate):²

(3) **Input:** [+vc] + k_[-vc]asa

	MAX	DEP	IDENT
☞ a. g _[+vc] asa			*!
☞ b. k _[-vc] asa			

¹In the following, I will write morphemes in the notation of the Vocabulary Items familiar from Distributed Morphology (Halle & Marantz 1993). See section 4 for more discussion.

²To keep the candidate space small, I will assume that floating features cannot survive in the output without association to a root node. As far as I see, this decision does not have any impact on the following arguments.

In this paper, I discuss two constraints which have been proposed to ensure preservation of floating features in the output, REALIZE-MORPHEME (van Oostendorp 2005), and MAXFLT (Wolf 2005; 2007). Whereas Wolf argues that REALIZE-MORPHEME is too weak to ensure mutation in cases where a single morphological category triggers more than one segmental change at the same time (“multiple-feature mutation”), I will show that the alleged cases of multiple-feature mutation are amenable to a REALIZE-MORPHEME-based account under an appropriate morphological analysis. Section 2 gives a general overview of possible approaches to the realization of floating features. In section 3, I use data from Texistepec Popoluca to introduce the basic problem which multiple-feature mutation seems to pose for REALIZE-MORPHEME. Section 4 motivates a morphological reanalysis of the Popoluca data under the assumption that apparently monomorphemic multiple-feature mutation results actually from the interaction of several mutation morphemes consisting of a single phonological feature. In section 5, I show that the same analysis is also possible and actually to be preferred for a more complex case of multiple-feature mutation in Nuer. Section 6 contains a summary and a general discussion of the theoretical results.

2. Approaches to Feature Survival

The OT-literature knows basically four possible approaches to guarantee the survival of floating input features.

2.1. MAX Constraints for Features

Under the assumption of MAX constraints for feature-value pairs (Lombardi 1998; 2001; Zhang 2000; Kim & Pulleyblank 2004), specific mutation morphemes can be guaranteed preservation. Thus ranking MAX [+vc] above MAX [-vc] would derive the surfacing of the floating [+vc] morpheme in Aka:

(4) **Input:** [+vc] + k_[-vc]asa

	MAX [+vc]	MAX [-vc]
☞ a. g _[+vc] asa		*
b. k _[-vc] asa	*!	

Unfortunately, as noted in Wolf (2007), this approach does not carry over to languages which have different mutation morphemes resulting in changes

to opposite feature values (e.g. one morpheme inducing voicing and one inducing devoicing). A case in point is Nuer which will be discussed in detail in section 5.

2.2. Markedness Constraints

Floating features might be saved by markedness constraints if reassociation leads to less marked structure. A possible example is manner mutation in Fula (Paradis 1992) where underlying root-initial consonants which are visible in class-2 forms are changed to stops in the realization of class-1 morphology.

(5) **Stopping Mutation in Fula** (Paradis 1992):

	‘healthy’	‘alive’	‘stunted’	‘small’	‘white’
Class 1	jamo	geeto	guddo	pamaro	dannejo
Class 2	yambe	yeetuɓe	wudduɓe	famarɓe	ranneɓe

If we take the mutating feature to be $[-\text{continuant}]$, overwriting can be derived from the constraint SONORITY-SEQUENCING (SON-SEQ) which prefers less sonorous (stop) onsets over more sonorous ones:

(6) **Input:** $[-\text{cont}] + f_{[+\text{cont}]}$ amar

	SON-SEQ	MAX	DEP	IDENT
☞ a. $P_{[-\text{cont}]}$ amar				*
b. $f_{[+\text{cont}]}$ amar	*!			

However, this solution is not unproblematic. Since SON-SEQ is ranked above IDENT, we have to make sure in some independent way that SON-SEQ does not cause all continuant sounds in Fula to be plosivized in non-mutation contexts (a possibility would be to assume an additional constrain against inserting new features such as DEP $[\text{cont}]$). Moreover this approach does not carry over to Aka where mutation creates a more marked phonological structure: Voiced plosives are less sonorous than voiceless ones, hence SON-SEQ would prefer non-mutating *kásá* over mutating *gásá*. In addition, it is well known that voiced stops are more marked than voiceless stops in general (Kager 1999).

2.3. REALIZE-MORPHEME

A further possible approach to ensure the survival of floating features is the constraint REALIZE-MORPHEME (van Oostendorp 2005) which requires that every input morpheme is realized by some phonological output material:³

- (7) REALIZE-MORPHEME: For every morpheme in the input,
 some phonological element
 should be present in the output
 (van Oostendorp 2005)

For affixes consisting exclusively of a single phonological feature, this constraint will always favor survival and hence overwriting of base material because a feature is the smallest possible exponent of a morpheme, and there is hence no other way to realize it than to make it part of an existing segment.⁴ This is illustrated for our Aka example in (8):

- (8) **Input:** [+vc] k_[-vc]asa

	REAL-MORPH	MAX	DEP	IDENT
☞ a. g _[+vc] asa				*
b. k _[-vc] asa	*!			

³REALIZE-MORPHEME is called PARSE-MORPH in Akinlabi (1996). Kurisu (2001) assumes a REALIZE-MORPHEME constraint which is substantially different from the one used here because it requires phonological distinctivity between paradigmatically related forms, not realization of underlying phonological material. Kurisu's use of this name is somewhat ironic since his constraint is intended to derive non-concatenative morphology without the assumption of a triggering morpheme. Gnanadesikan (1997) and de Lacy (2002) argue for versions of REALIZE-MORPHEME (labeled MORPH REAL and MORPH DISF respectively) which combine the requirements of input preservation and distinctiveness in different ways.

⁴One possible alternative would be to create an epenthetic segment which is the host of the floating feature instead of overwriting an input segment. This possibility seems indeed to be attested in Yowlumne (Yawelmani) where the feature [constricted glottis] is realized in specific phonological contexts as part of a base segment causing glottalization, and in other phonological contexts as an independent segment (a glottal stop; Zoll 1996). Note that a floating feature which surfaces in all phonological contexts as an independent segment from the base would be indistinguishable from an underlying segment, and would simply not be analyzed as an underlying floating feature.

2.4. MAXFLT

The fourth possibility to save floating features despite a world of hostile faithfulness constraints is to stipulate a faithfulness constraint which is specific to floating material. A constraint of this type was already proposed by Zoll (1996) under the name MAX SUBSEGMENT and has been argued for recently in Wolf (2005; 2007) who calls his version of this constraint MAXFLT:

- (9) MAXFLT: All autosegments that are floating in the input have output correspondents. (Wolf 2007)

Just as REALIZE-MORPHEME, MAXFLT is well-suited to derive survival of the floating feature in the Aka case:

- (10) **Input:** [+vc] k_[-vc]asa

	MAXFLT	MAX	DEP	IDENT
☞ a. g _[+vc] asa				*
b. k _[-vc] asa	*!			

REALIZE-MORPHEME and MAXFLT seem to work in a roughly equivalent way for the Aka data, and both are free from the shortcomings we have discussed for approaches to featural survival based on markedness constraints or featural faithfulness constraints. Crucially, they can account for markedness-increasing mutation, and for cases where the same language exhibits mutation for two values of the same phonological feature (bidirectional mutation). Given this near equivalence, it is natural to ask whether one of these constraints can be dispensed with. For conceptual reasons, MAXFLT is the obvious candidate for elimination since it is less general: It is restricted to mutation and similar non-concatenative processes, while REAL-MORPH also applies to affixal morphology for which it predicts for example that single-segment affixes should have special protection against complete deletion. However, Wolf (2005) argues that there are instances of multiple-feature mutation which can be captured by MAXFLT, but are beyond the capacity of REALIZE-MORPHEME and hence require the postulation of the more powerful constraint. A representative case will be discussed in the next section.

3. The Phonology of Multiple-Feature Mutation

A simple case of multiple-feature mutation discussed by Wolf is nominative/ergative person agreement in Texistepec Popoluca (Wichmann 1994; Reilly 2002; 2004) where 1st person verb forms are marked by nasalizing the initial consonant, 2nd person forms by nasalizing and palatalizing the initial consonant, and 3rd person forms by denasalizing and palatalizing the initial consonant. This is illustrated in (11):

(11) **Mutation in Texistepec Popoluca** (Wichmann 1994; Reilly 2002):

Infin.	1P	2P	3P	
dastah	nastah	ɲastah	dʲastah	‘dig’
naj	—	—	dʲaj	‘sprout’

Wolf captures these patterns by positing the person markers in (12) (assuming that palatalized segments have the vocalic feature [–back], while non-palatal consonants are [+back]):⁵

(12) **Texistepec Popoluca Person Markers in Wolf (2007):**

[+1] ↔ [+nasal]

[+2] ↔ [+nasal–back]

[+3] ↔ [–nasal–back]

The 1st person marker consists of a single feature and can be analyzed exactly as mutation in Aka. However, the 2nd and 3rd person markers contain more than one floating feature which makes them special. MAXFLT also predicts the correct outputs for these cases as shown in (13). In principle, none (13-d), one (13-b,c), or two (13-a) features of the initial root consonant could be overwritten. Since MAXFLT outranks IDENT, realization of both floating features is achieved at the cost of the corresponding features of the stem-initial consonant.

⁵In the following, I adapt the semi-formal morphemic representations of floating material in Wolf (2005; 2007) to the conventions used in this paper.

(13) **Input:** $[-nas-bk] + n_{[+nas+bk]}aj$

	MAXFLT	IDENT
☞ a. $d_{[+nas+bk]}^j aj$		**
b. $d_{[-nas+bk]}^j aj$	*!	*
c. $n_{[+nas-bk]}^j aj$	*!	*
d. $n_{[+nas+bk]}^j aj$	*!*	

On the other hand, REALIZE-MORPHEME appears to be unable to derive the same set of facts as shown in (14). The only candidate which is eliminated by REALIZE-MORPHEME is (14-d) where none of the floating affix features is realized. All candidates which realize at least one affix features fare equally well for the constraint, and since IDENT favors features which are underlyingly associated to segments, the candidates where only one floating feature overwrites (14-b,c) win and form a tie predicting variation between two unattested forms:

(14) **Input:** $[-nas-bk] + n_{[+nas+bk]}aj$

	REAL-MRPH	IDENT
☞ a. $d_{[-nas-bk]}^j aj$		*!*
☞ b. $d_{[-nas+bk]}^j aj$		*
☞ c. $n_{[+nas-bk]}^j aj$		*
d. $n_{[+nas+bk]}^j aj$	*!	

Wolf's argument for MAXFLT and against REALIZE-MORPHEME seems to be conclusive. MAXFLT is more powerful, but this power seems to be fully justified by the empirical facts of multiple-feature mutation. However, in the following section, I will argue that the classification of Texistepec Popoluca as multiple feature mutation is unwarranted in the first place. Under closer morphological scrutinization, Texistepec Popoluca and similar cases turn out to be well-behaved cases of single-feature mutation which can be captured straightforwardly by REALIZE-MORPHEME.

4. The Morphology of Multiple-Feature Mutation

To get a better understanding of the mutating agreement morphology in Texistepec Popoluca, it is important to consider typical properties of complex agreement systems which employ purely concatenative morphology. In particular, there is growing evidence that many apparently atomic agreement markers have actually an articulated internal structure. In other words: they can be decomposed into different independent morphological forma-

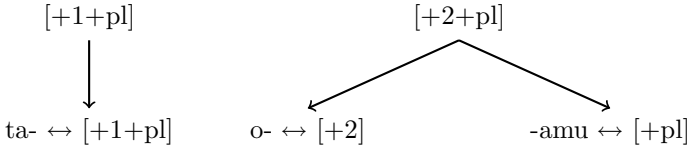
tives. This point is probably most obvious in languages with “circumfixal” agreement where an argument is coindexed on verbs by cooccurring prefixal and suffixal material. A case in point is the Austronesian language Muna (van den Berg 1989).

(15) **Muna Subject Agreement Marking** (van den Berg, 1989:51):

	sg	pl
1exc	a-kala	ta-kala
1inc	do-kala	do-kala-amu
2	o-kala	o-kala-amu
2 (polite)	to-kala	to-kala-amu
3	no-kala	do-kala

While a superficial analysis might stipulate circumfixes such as **o-** **-amu** for the 2pl contrasting with the 2sg prefix **o-**, a much more parsimonious analysis is possible if we treat **o-** as a general 2nd person marker (compatible with both, 2sg and 2pl), and **-amu** as a general plural marker which also occurs in the 1st person inclusive and the 2pl polite forms. Under this approach, Muna uses standardly two markers, one for person, and one for number, where Indoeuropean languages tend to use only one single marker which expresses information about both categories. Importantly, also in Muna the separation of person and number is not absolute. Thus in the 3rd person, the language uses the atomic markers **no-** and **do-** to refer to 3sg and 3pl.

The most elaborate theoretical approach to split agreement of the Muna type is the concept of postsyntactic fission which has been developed in Distributed Morphology (DM; Halle & Marantz 1993). In DM, as in a number of other realizational approaches to morphology, the morphology component of the grammar provides the output of syntax (syntactic heads without phonological specification) with phonological content by inserting so-called vocabulary items (VIs, lexical entries which pair a – possibly underspecified – morphosyntactic feature structure with a piece of specific phonological structure) into the heads. In the standard case, every head is filled by exactly one VI. However, in cases of discontinuous exponence such as in Muna, it is assumed that more than one VI realizes the features of the head as illustrated in (16), where the vocabulary item for **ta-** expresses both person and number of the syntactic head while exponence of the two categories is distributed among the markers **o-** and **-amu** in (16-b):

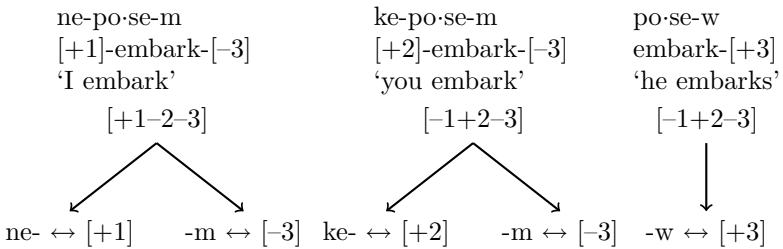
(16) **Standard and Fissioned Exponence in Muna:**

Under a proper interpretation of the Elsewhere Principle (Kiparsky 1973)⁶, this analysis captures the important generalization that (apart from cases of allomorphy) a marker expressing all features of a head blocks less specific markers which would also be compatible with the head, but would only express a subset of the same features (“discontinuous bleeding”, see Noyer (1992)). Thus in Muna, plural **-amu** is suppressed in exactly those cases where there is a single marker which expresses plural and a specific person category at the same time.

Whereas Muna splits up person and number, discontinuous exponence is also attested in a way which splits up single categories into finer-grained structure. For example Algonquian languages exhibit different affixes for different person features. Thus in the Menominee data in (17), the contrast between [+3] and [-3] is expressed by the suffixes **-w** and **-m** while [+2] is realized by the prefix **ke-** (Bloomfield 1962; Trommer 2008):

(17) **Discontinuous Exponence of Person in Menominee**

(Bloomfield 1962):



Thus the apparently atomic category 2nd person is realized by two different markers which express more atomic person features⁷

⁶In DM, the Elsewhere Principle is integrated into the Subset Principle, the central principle governing insertion of VIs into heads (Halle 1997).

⁷See Harley & Ritter (2002) and Trommer (2008) on more crosslinguistic evidence for abstract person features of this type.

Split exponence of the same type is also found in the Popoluca family. As shown in Müller (2006), transitive and intransitive agreement in Sierra Popoluca (18) has separate markers for the features [+1], [-1] and [+2] (and case) as shown in (19). Thus the 1st person inclusive is marked by **a-** for [+1] and **t-** for [+2] while the 2nd person is realized by **m-** for [+2] and **i-** for [-1].

(18) **Intransitive Agreement in Sierra Popoluca** (Müller 2006)

Abs			Erg		
1exc	[+1-2-Erg]	a-	1exc	[+1-2+Erg]	a-n-
1inc	[+1+2-Erg]	t-a-	1inc	[+1+2+Erg]	t-a-n-
2	[-1+2-Erg]	m-i-	2	[-1+2+Erg]	i-n-
3	[-1-2-Erg]	-	3	[-1-2+Erg]	i-

(19) **VIs for Sierra Popoluca** (Müller 2006)

n-	↔	[+Erg]
a-	↔	[+1]
i-	↔	[-1]
m-	↔	[+2] / [-Erg]
t-	↔	[+2] / [+2]

Although verb agreement in Texistepec Popoluca is phonologically much more reduced, it turns out that it is morphologically almost as complex as its Sierra Popoluca relative. (20) repeats the relevant data from (11):

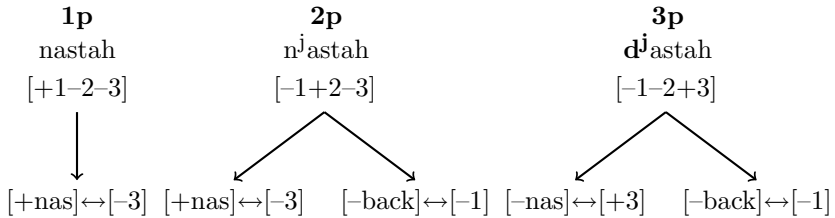
(20) **Mutation in Texistepec Popoluca** (Wichmann 1994; Reilly 2002)

Root	1P	2P	3P	
dastah	nastah	n ^ʃ astah	d ^ʃ astah	‘dig’
naj	naj	n ^ʃ a ^j	d ^ʃ a ^j	‘sprout’

Under a fission analysis it is now natural to posit the subsegmental VIs in (21) resulting in the mappings in (22) for the verb **dastah**, ‘dig’:

(21) **VIs for Texistepec Popoluca under a Fission Analysis:**

[-3]	↔	[+nasal]	(1st and 2nd person)
[-1]	↔	[-back]	(2nd and 3rd person)
[+3]	↔	[-nasal]	(3rd person)

(22) **Texistepec Person Agreement under a Fission Analysis:**

The fission analysis captures naturally common features of the mutation patterns in different person categories which remain unaccounted under Wolf's multiple-feature mutation analysis: All non-first person categories show palatalization, and all non-third-person categories show nasalization. Moreover fission is independently required in 1st person inclusive forms which combine the prefix **ta-** with the nasalization also found in 1st person exclusive forms. (23) shows the full set of nominative/ergative agreement markers:

(23) **Full Set of Texistepec Popoluca Nominative/Ergative Agreement Markers** (Wichmann 1994; Reilly 2002):

Root	1P	1+2 P	2P	3P	
dastah	nastah	ta-nastah	n ^j astah	d ^j astah	'dig'
naj	naj	ta-naj	n ^j aj	d ^j aj	'sprout'

This is straightforwardly integrated into the analysis by the additional VI in (24):

(24) [+1+2] ↔ ta- (1st person inclusive)

On the phonological side, the fission analysis obviates the postulation of MAXFLT for Texistepec Popoluca if we make the assumption that REALIZE-MORPHEME in DM terms refers not to syntactic heads, but to vocabulary items. This is expected anyway since phonologically specified VIs provide the appropriate input to phonology, not the abstract features of lexical heads. Since now every floating feature corresponds to one morpheme (VI), high-ranked REALIZE-MORPHEME requires that all of them surface in the output. This is illustrated for the first person form **nastah** (derived by nasalization of the initial consonant from the root **dastah**) in (25):

(25) **Input:** [+nas] +[-back] + d_[-nas+bk]astah

	REAL-MORPH	IDENT
☞ a. n ^j _[+nas-back] astah		**!
b. d ^j _[-nas-back] astah	*!	*
c. n _[+nas+back] astah	*!	*
d. d _[+nas+bk] astah	*!*	

5. Multiple-Feature Mutation in Nuer

We turn now to a second set of data discussed by Wolf which shows in an even clearer way that a fission-analysis of multiple-feature mutation is well-motivated. In the Western Nilotic language Nuer (Crazzolara 1933), different non-finite categories of the verb are marked by mutation of the final root consonant. In the negative present participle, all obstruents turn into voiceless stops, and in the past participle they get voiceless fricatives. The infinitive shows the underlying contrast:

(26) **Mutation in Nuer Non-Finite Forms** (Crazzolara 1933):

	‘over- take’	‘hit’	‘pull out’	‘scoop hastily’	
Infinitive	coβ	ja:ç	guð	kêp	
Negat. Pres. Ptc.	còp	ja:c	guṯ	kep	[-voice -continuant]
Past Ptc.	cof	ja:ç	guθ	kêf	[-voice +continuant]

Wolf (2005) assumes the morphemes in (27) for the participle forms:

(27) **Nuer Mutation Morphemes in Wolf (2005):**

[+Part +Neg -Past] ↔ [-voice -continuant]

[+Part+Past] ↔ [-voice +continuant]

As for Texistepec Popoluca, there is a straightforward reanalysis invoking fission. I assume that participles are differentiated by the features [+/-Participle], [+/-Past] and [+/-Negative] which are part of an inflectional head (probably Tense), where the negative present participle is characterized as [+Participle -Past + Negative] and the past participle as [+Participle -Past -Negative]. The relevant floating affixes are shown in (28).

(28) **VIs for Nuer Non-finite Forms under a Fission Analysis:**

[+Part] ↔ [-voice]

[+Past] ↔ [+continuant]

[+Neg] ↔ [-continuant]

Again there are close parallels to this type of morphological fission which involve fully segmental affixes. Thus in German, specific features of infinitives and participles are also expressed by different affixes as shown in (29). The default marker for Tense which shows up in infinitives, present participles (and past participles of specific verbs which are not shown here) is **-n**, past tense is marked by **-t**. [+Participle] is realized as **-d** in the context of the non-past, and as **ge-** in past tense participles.

(29) **Affixal Fission in German Infinitive Forms:**

	Weak	Strong
Infinitive	weh-en	seh-en
Present Participle	weh-en-d	seh-en-d
Past Participle	ge-weh-t	ge-seh-en
Past 2sg	weh-t-est	sah-st

(30) shows the VIs for these markers following the analysis of Trommer (2007). Note that (30-b) is blocked by (30-a), and (30-d) by (30-c) under appropriate insertion conditions according to the Elsewhere Principle.

(30) **VIs for German Infinitive Forms:**

a. [+Tense +Past] ↔ -t

b. [+Tense] ↔ -n

c. [+Part] ↔ -d / — [-Past]

d. [+Part] ↔ ge-

According to Wolf (2005; 2007), Nuer verbs pose a second problem for a REALIZE-MORPHEME based approach to the realization of floating features: Floating features cooccur with affixal morphology in the expression of morphological categories. Thus, as shown in (31), the 3sg of the indicative present active shows the suffix **-e** and in addition mutation to a voiced stop. The corresponding 1pl form is marked by the suffix **-kɔ** and final consonant mutation to a voiceless fricative:

(31) **Multiple-Feature Mutation + Affixation** (Crazzolara 1933):

	‘overtake’	‘pull out’	‘scoop hastily’	
Infinitive	coβ	guð	kêp	
3sg.ind.pres.act.	cóβ-é	gúð-é	kêβ-é	[+vc+cont]-ε
1pl.ind.pres.act.	còɔf-kò	gwòθ-kò	kèaf-kò	[-vc+cont]-kɔ

(32) shows the affix entries Wolf assumes for these forms:

(32) **Mutation Morphemes for (32) in Wolf (2005):**

[+3+Ind-Past+Act] ↔ [+voice+continuant]-ε

[+1+pl-Past+Act] ↔ [-voice+continuant]-kɔ

Crucially, REALIZE-MORPHEME would not require surface realization for any of the floating features in (32) since the corresponding morphemes are already visible in the output through the segmental affixes.

A proper evaluation of the data in (31) requires considering the full paradigm of the present indicative active in Nuer which all involve consonant mutation. (33) provides these forms for the verb **ka:f**, ‘to lay hold of’. (34) shows the characteristic phonological features of the root-final consonant in the single forms:

(33) **Nuer Present Indicative Active Paradigm** (Crazzolara 1933):

	singular	dual	plural
1 (exc.)	ka:β-à		ka:f-kó
1 (inc.)		ka:f-nè	ka:f-né
2	ka:β-ì		ka:f-é
3	ka:β-è		ka:f-ké

(34) **Mutation Features of Root-final Consonants:**

	singular	dual	plural
1 (exc.)	[+vc+cont]-a		[-vc+cont]-kɔ
1 (inc.)		[-vc+cont]-nè	[-vc+cont]-ne
2	[+vc+cont]-i		[-vc+cont]-e
3	[+vc+cont]-ε		[-vc+cont]-kε

Assigning separate floating features to every single affix in (33) misses three important generalizations: *First*, in all indicative active forms the stem-final consonant is [+continuant]. *Second*, in all singular forms, the stem-final consonant is [+voice]. *Third*, in all non-singular forms, the stem-final consonant

is [-voice]. These generalizations are lost under Wolf's account, but can be naturally expressed if we assume an analysis where floating features realize fissioned vocabulary items in a one-by-one manner such that [+voice] expresses [-plural] (singular and dual)⁸, [-voice] expresses [+plural] (all plural forms), and indicative present active ([+Ind-Past+Act]) is realized as [+continuant]:

(35) **VIs for Nuer Finite Forms in a Fission-Analysis:**

[-pl] ↔ [+voice]

[+pl] ↔ [-voice]

[+Ind-Past+Act] ↔ [+continuant]

The only additional step this analysis requires is the assumption that plural person-number affixes, are not primary exponents of [+pl], but person markers which exhibit context-sensitive allomorphy with respect to the floating plural marker, as shown in (36):

(36) **VIs for Nuer Person Affixes:**

[+1] ↔ -a [1] ↔ -kɔ /___ [+pl]

[+2] ↔ -i [2] ↔ -e /___ [+pl]

[+3] ↔ -ε [3] ↔ -kε /___ [+pl]

Since an analysis which assigns a single phonological feature to every floating affix, captures cases of systematic partial homonymy in the Nuer paradigm which get lost under Wolf's multiple-feature mutation analysis, I conclude that the fission analysis based on REALIZE-MORPHEME is not only a possible, but also the preferable alternative.

6. Summary and Discussion

This paper has shown that arguments against a REALIZE-MORPHEME-based approach to floating-feature realization which are based on apparent multiple-feature mutation disappear under appropriate morphological sub-

⁸The classification of singular and dual as [-plural] follows Noyer (1998).

analysis. Wolf (2007) adduces cursorily a number of other cases where floating features cooccur either with other floating features or with affixation. However none of these cases seems to provide conclusive against REALIZE-MORPHEME since mutation in the relevant languages is unidirectional. For example in German, productive vowel-changing mutation (umlaut in contrast to ablaut, cf. Wiese 1994) always fronts vowels, but never backs them. Changes of this type might well follow from markedness or featural MAX constraints (cf. section 2). What makes Texistepec Popoluca and Nuer intriguing is exactly that they seem to combine bidirectional mutation and multiple-feature mutation, and it is remarkable that exactly these cases turn out to exhibit single feature mutation which is blurred by morphological complexity.

Of course, it is not possible under Richness of the Base to exclude the possibility that a morphological category specifies more than one floating feature underlyingly. Under a REALIZE-MORPHEME-based account, this might lead to three possible outcomes: *First*, there might be consistent realization of all subsegmental material due to markedness or featural MAX constraints, as long as all relevant changes are unidirectional. *Second*, due to REALIZE-MORPHEME one of the floating features is always realized, whereas the other ones are suppressed by markedness constraints and standard faithfulness constraints. This case would be indistinguishable from an underlying morpheme which has just a single floating feature. *Third*, one of the floating features might be realized in a specific phonological context C_1 while another one is realized in a context C_2 . This might be the appropriate analysis for “quirky mutation” in Breton which spirantizes some sounds, but devoices other ones (Wolf 2007).

Given the empirical facts, Wolf’s argument against REALIZE-MORPHEME is turned upside-down into an argument against MAXFLT: MAXFLT can derive bidirectional multiple-feature mutation, whereas REALIZE-MORPHEME cannot. Given the non-existence of this type of mutation, a theory which uses REALIZE-MORPHEME, but abandons MAXFLT is typologically more restrictive and hence to be preferred.

That MAXFLT and comparable constraints are dispensable raises also the question whether there are any constraints which make specific reference to floating features. Since Trommer (2008) has shown that the polarity effects for which Wolf (2005; 2007) invokes another floating-feature-specific constraint (NOVACUOUS DOCKING) follow from more general phonological factors, it is well possible that no such constraints are necessary.

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