A constraint-based approach to morphological neutralization*

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1. Introduction

In this paper we argue that a theory using Impoverishment Rules to account for morphological neutralization may be descriptively adequate for certain language-specific meta-paradigmatic structures. However, the lack of a theory of impoverishment leads to a device that is too powerful. We will sketch an alternative way of treating morphological neutralization through a constraint-based grammar that may be in a better position to account in a more principled way for the observed patterns of syncretism. The proposed theory takes the morphosyntactic representation as the input for a constraint-based evaluation (see Wunderlich (2004) for a similar constraint-based approach to syncretism). This evaluation is done according to the principles of Optimality Theory: constraints are violable and ordered in a ranking that differs per language. We sketch how a certain type of impoverishment can be described with such a constraint-based grammar. We focus on cases that Baerman (2005) would refer to as 'unstipulated syncretism'; these are syncretisms in which the syncretised forms share one or more feature values. These syncretisms in principle could be described by employing underspecification. However, we will show that this solution is (at least in some cases) insufficient, since the observed syncretic patterns are independent of the specific morphemes and thus cannot be explained by reference to individual properties of the morphemes involved. Considered this way, we look at meta-paradigmatic syncretisms in the sense of Williams (1991). At this stage, the theory is in need of further development; still, we believe the initial results are promising.

The paper is organized as follows. First, we describe cases in which morphophonology does not spell out morphosyntactic features ("neutralization") and explain how Impoverishment rules account for language-wide systematic neutralization. In Section 3 we illustrate some problems of Impoverishment

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Rules and formulate the need for a theory of impoverishment. In Section 4 we sketch our approach to the relation between morphosyntax and the spell-out of forms and we give some examples. Section 5 is a brief evaluation.

2. Different types of Neutralization

We use the notion "neutralization" for cases in which 'morphology lets down syntax', to quote Baerman et al. (2005:1), that is, cases in which morphology does not spell out morphosyntactic distinctions. Following this definition, we assume that the absence of inflection across-the-board in predicative adjectives, illustrated in (1), is not a form of morphological neutralization:

(1) a. Het meisje is mooi/*mooi-e
'The [neut.] girl is beautiful'
b. De jongen is mooi/*mooi-e
'The [common] boy is beautiful'

Contrary to Romance and Slavic languages, there is no spell-out of agreement in predicative position in Dutch. One does not want to account for this absence of inflection at the level of morphology, since the absence of inflection reflects the absence of agreement in syntax.

Contrary to this, the fact that the same form of the inflected attributive adjective occurs in various contexts seems to be property of morphology, since there is a context in which the gender distinction is marked:

(2)	a.	een mooi / *mooi-e	meisje	'beautiful girl'	[–DEF, +NEUT, –PL]
	b.	het *mooi / mooi-e	meisje		[+DEF, +NEUT, –PL]
	c.	een *mooi / mooi-e	auto	'beautiful car'	[–DEF, –NEUT, –PL]
	d.	de *mooi / mooi-e	auto		[+DEF, –NEUT, –PL]

Therefore, we cannot say that gender-features are syntactically not present in this position. Rather, morphology neutralizes syntactic distinctions.

The examples in (2) show that attributive adjectives mark gender-distinction in indefinite DPs containing a singular noun. Consider now the plural:

(3)	a.	*mooi / mooi-e	meisjes	'beautiful girls'	[+NEUT, +PL]
	b.	*mooi / mooi-e	auto's	'beautiful cars'	[–NEUT, +PL]

These examples show that in plural contexts the gender distinction is neutralized. This neutralization is not accidental homonymy but systematic, as can be seen from same pattern in the definite determiners and demonstratives.

(4)	neuter:	non-neuter:	plural:
	het meisje 'the girl'	de jongen 'the boy'	de meisjes 'the girls'
	dit meisje 'this girl'	deze jongen 'this boy'	deze meisjes 'these girls'
	dat meisje 'that girl'	die jongen 'that boy'	die meisjes 'those girls'

Distributed Morphology (henceforth: DM) provides two ways to deal with neutralization: underspecification of Vocabulary Items and Impoverishment Rules. DM is a 'realizational' theory of morphology. Affixes 'realize' morphosyntactic features that originate in syntax. This allows for underspecification of affixes since these are, contrary to lexicalist approaches (cf. Jensen and Stong-Jensen 1984, DiSciullo & Williams 1987), not considered to be the source of syntactic and semantic distinctions: rather, they spell out the morphosyntactic features. For this reason DM is also often referred to as a 'late insertion'-theory.

Within DM, the insertion of affixes is viewed as a competition, in which the most specific affix, i.e. the affix with the most features matching the morphosyntactic representation, wins out. If for whatever reason the most specific affix cannot be inserted, the next specific affix comes into play and so on, until the last affix, often referred to as 'the default' will be inserted. A simple example, which accounts for adjectival inflection in Dutch, illustrates this idea.

The examples in (2) show that the zero-affix only occurs in a single environment; the only condition in which the zero-allomorph shows up, is in the case that the DP is indefinite, singular and neuter (cf. (2a)). By implication, the zero-affix has the most specific feature specification; this is formalized in (5), which can be seen as a set of disjunctively ordered Vocabulary Items (henceforth: VIs), with the most specific VI ordered first.

(5)	[+neut, −plural, −definite]	↔	-Ø
	[ ]	↔	-e

In (5), the features on the left-hand side trigger insertion of the affix on the right-hand side. The ordered VIs in (5) account for the observed contrast in (2).

In this example, the selection of VIs is regulated through underspecification and disjunctive ordering of rules according to the Elsewhere Principle (Kiparsky 1973). So, the observed neutralization of attributive adjectives is a property of the VIs. Furthermore, it is assumed that Vocabulary insertion is subject to the Subset Principle (Halle 1997). This principle requires that the morphosyntactic features of the VI form a subset of the features of the morphosyntactic node. That is, the VIs cannot insert any new features that are not present in syntax.

Another way to account for selection of VIs is with the aid of Impoverishment Rules. The examples (3) and (4) show that the nominal plural in Dutch

never distinguishes between neuter and common gender. This can be expressed through a rule that simply deletes gender in the context of the feature [+plural] (6):

(6) [α gender] → Ø / [+plural]

The Impoverishment Rule (6) would apply after syntax, and before spell-out. Thus expressing the fact that a particular feature, may be syntactically present but morphologically absent. The Impoverishment analysis differs from the analysis in terms of underspecification since under the Impoverishment-analysis, it is impossible that there exist VIs making a distinction between gender in the plural, since the Impoverishment rule wipes out the possibility for such distinctions. Therefore, the Impoverishment analysis is more satisfactory.

3. The problem of Impoverishment Rules

Are there limitations on what Impoverishment Rules can do? Consider the following example taken from Carstairs-McCarthy's (1998) commentary on a paper by Noyer (1998). The following data come from pseudo-Turkish (leaving out irrelevant cases) (Carstairs-McCarthy 1998:287):

(7)

	Singular		Plural
Nominative	ev	'house'	ev-ler
Locative	ev-de		**ev-ler-de**
Ablative	ev-den		**ev-ler-de**

The syncretism indicated in bold is not found in agglutinative languages. However, as Carstairs-McCarthy observes such syncretisms can easily be described, with an impoverishment rule.[1]

What is lacking is a theory of impoverishment. By implication, all kinds of neutralization are to be expected, but this is not what is found in natural languages. There are neutralizations that are simply non-existent, while other neutralizations are frequent across languages. We would like to draw a parallel here with the phonological rules of the SPE-type that were abandoned in favour of a constraint-based approach to phonology in Optimality Theory (Prince and Smolensky 2004). The Impoverishment rules dealing with morphological neutralization have the same form as SPE-rules, i.e. they are context-sensitive rewrite rules, and we can express almost any conceivable, existing and non-existing, morphological neutralization with such rules. What we would like to argue for is a theory of impoverishment in the sense that we should aim for a more principled account for the observed neutralizations that also enables us

to exclude patterns of neutralization not found in natural languages. In this sense this paper wants to contribute to a line of inquiry that goes back to Williams (1981), Carstairs-McCarthy (1984) and subsequent literature.

4. A constraint-based approach to neutralization

Our claim is that Impoverishment Rules should be replaced by a more restricted means to account for certain patterns of syncretism in morphology. Of course, one could try to argue that the patterns of syncretism themselves do not exist as such but are mere epiphenomena of the underspecification of Vocabulary Items. However, we have shown above that this option should only be used for those cases where we can actually see that it is a property of the VIs since elsewhere in the morphology the syntactic distinction is morphologically reflected.

We would like to propose here that morphosyntactic categories may result from optimality theoretic constraint interaction (see for other proposals to employ OT in morphosyntactic spell-out: Wunderlich 1996, 2004; Bresnan 2001, 2002). To illustrate this, assume an optimality-style grammar in which the underlying form is given by the output of morphosyntax (thus, sticking to the 'late insertion' idea of DM). The resulting morphosyntactic feature bundles form the input to the spell-out component, which is regulated through an evaluation procedure on the basis of a language-particular ranking of universal constraints. The set of candidates that are evaluated are generated by a function GEN that may freely combine all affixes with a particular stem. The set of affixes and their morphosyntactic specifications is given. Specific high-ranking constraints will eliminate candidates that double affixes, put the affixes in the wrong order, etc. Here we mostly concentrate on how we may deal with impoverishment in such a theory.

As an example, we consider the Dutch verbal paradigm. Let us look at the indicative present tense forms:[2]

(8)

Stem		noem 'call'	loop 'walk'	zijn 'be'
Singular pres. tense	*1st*	noem	loop	ben
	2nd	noem-t	loop-t	ben-t
	3rd	"	"	is
Plural pres. tense	*1st*, *2nd, 3rd*	noem-en	loop-en	zijn

In plural contexts, person-features are neutralized: the same VI is selected in all plural contexts. In case one insisted on the use of an impoverishment rule to describe the observed syncretism, one would formulate a rule like (9):[3]

(9) [α person] → Ø / [plur]

To account for the fact that [αperson] will never be spelled-out in Dutch in the context of [plural], we assume that at the level of Morphological Structure (Halle & Marantz 1993) ordered after syntax but before spell-out, person and number features are fused in a single morphosyntactic node that will be spelled out by a single affix. We also assume that features like [past] and [plural] are privative. The absence of these features is interpreted as 'present' and 'singular'. We may assume that the constraints in (10a,b) interact in a specific way.

(10) a. *COMPLEX 'No complex affix'
b. MAX ([PLURAL]), MAX ([PAST]), MAX([α PERSON])

A MAX-constraint (cf. McCarthy & Prince 1995) is violated as soon as a feature in the morphosyntactic representation is not part of the lexical specification of a VI involved in spell-out. *COMPLEX is a constraint, which is violated as soon as two features are spelled-out by the same affix; any affix that spells-out [plural, αperson] is complex (by definition), just as any hypothetical affix that spells-out [plural, past]. *COMPLEX expresses one side of the idea that affixes preferably stand in a one-to-one correspondence with the morphosyntactic property they spell out. This constraint would be high-ranked in agglutinative languages. By ranking *COMPLEX above MAX([α PERSON]), as in (11), no complex affixes involving [person] in the context of [plural] and [past] can show up.

(11) MAX ([PLURAL]), MAX([PAST]) >> *COMPLEX >> MAX([PERSON])

The tableau in (13) exemplifies this. Keep in mind the following lexical specifications of the relevant VIs (12); we have added a hypothetical affix *-st* expressing the features [2, plur].

(12) [plur, 2] ↔ -st [past] ↔ -t/de
[plur] ↔ -en [1] ↔ -Ø
[ ] ↔ -t

(13)

noem-[plur, 2]	MAX [PLUR]	MAX([PAST])	*COMPL.	MAX([PERS])
☞ noem-en	√	√	√	*
noem-st	√	√	*!	√
noem	*!	√	√	*
noem-t	*!	√	√	*

The evaluation of the MAX([PAST]) constraint is not very interesting: since [past] is not present in the underlying form, all candidates vacuously satisfy this constraint. The hypothetical form *#noem-st* is the optimal candidate if we only consider the MAX-constraints: it spells out all (and only) the features that are present in the underlying form. However, this form is not the optimal candidate since it violates *COMPLEX that ranks higher than MAX([α PERSON]). Therefore, *noem-en* is more optimal, even though it does not spell out any person-features.

Let us now consider the past tense in Dutch verbal inflection:

(14)

Stem		noem 'call'	loop 'walk'	zijn 'be'
Sing. past tense	*1st*, *2nd, 3rd*	noem-de	liep	was
Plural past tense	*1st*, *2nd*, *3rd*	noem-de-en	liep-en	war-en

In the past tense no person features are spelled-out. Given the constraint-ranking above, this can be accounted for: since MAX([PAST]) outranks MAX([α PERSON]), and MAX([α PERSON]) is ranked lower than *COMPLEX, we do not expect to find affixes that spell out the past tense and person features at the same time.

Note that the analysis developed thus far does not account for the fact that there cannot be forms with two affixes: one expressing [past] and one expressing [α person]. A hypothetical form *noem-de-t* having a past tense affix and a third person affix does not violate the constraint *COMPLEX since that constraint only forbids *single* affixes expressing more than one feature. Therefore, in order to rule out this form, we have to rely on another constraint that penalizes any form of affixation to an already affixed form: *AFFIX_TO_AFFIX.

(15) *AFFIX_TO_AFFIX
Do not add any affixes to affixed stems.

This constraint takes the same place in the ranking as *COMPLEX, ruling out forms with more than one affix that do not involve the features [plural] and [past]. The tableau in (16) gives the evaluation of the most relevant candidates:

(16)

noem- [+fin,3r,past]	MAX [PLUR]	MAX [PAST]	*COMPL.	*AF_T_AF.	MAX [PERS]
noem-de-t	√	√	√	*!	√
☞ noem-de	√	√	√	√	*
noem	√	*!	√	√	*
noem-t	√	*!	√	√	√

The constraint *Affix_to_affix and its ranking below the two highest ranking max-constraints also accounts for the fact that multiple affixes are found precisely in those cases where the high-ranking constraints max([plural]) and max([past]) can only be satisfied by affixation (i.e. in past plural forms). The tableau in (17) contains the relevant constraint evaluations:

(17)

noem-[fin,plur,3r, past]	max [plur]	max [past]	*af_t_af	*complex	max [pers]
☞ noem-de-en	√	√	*	√	*
noem-st	√	*!	√	*	√
noem	*!	*	√	√	*
noem-de-t	*!	√	*	√	*

In Section 2, we observed that Dutch also exhibits a neutralization pattern that can be described with the Impoverishment Rule in (6).

We can easily account for the observed pattern by adding the constraint max([neuter]) to our constraint ranking at the same position as the constraint max([person]) and by adding a constraint max([def]) above max([neuter]). Consequently, we predict that [neuter] can only be spelled out if there is no [plural]-feature or [definite]-feature present that needs to be spelled out. Assuming the VIs in (18), this will give us the correct pattern:

(18) [neuter] ↔ -Ø [plural] ↔ -e [def] ↔ -e

The tableaux in (19) show how the constraint ranking derives the correct forms for two different contexts (leaving out irrelevant constraints).

(19)

aardig [neuter]	max [plur]	af_t_af	max [def]	max [neut]
aardig	√	√	√	*!
aardig-e	√	√	√	*!
aardig-e-e	√	*!	√	√
☞ aardig-Ø	√	√	√	√

aardig [plur],[neuter],[def]	max[plur]	af_t_af	max [def]	max [neut]
aardig	*!	√	√	*!
☞ aardig-e	√	√	√	*!
aardig-e-e	√	*!	√	√
aardig-Ø	*!	√	√	√

The analysis of the syncretisms in the inflectional verbal paradigm and the adjectival paradigm of Dutch shows that the effect of Impoverishment rules

can be implemented using an Optimality-style constraint interaction in which max-constraints are in competition with certain markedness-constraints, such as *COMPLEX and *AFFIX_TO_AFFIX.

5. Evaluation

What do we gain from this constraint-based analysis vis-à-vis the rule-based analysis of impoverishment? First, let us return to Carstairs-McCarthy's example of pseudo-Turkish, which showed that Impoverishment Rules predict the existence of neutralizations that are non-existent. Unlike the rule-based analysis, our constraint-based approach cannot describe pseudo-Turkish. We would have to conclude from the forms in the singular that the obligation to spell-out the locative and ablative cases is higher ranked than AFFIX_TO_AFFIX. Therefore, we expect these cases to be spelled-out everywhere else, unless *COMPLEX would interfere. However, this constraint will not be very helpful in this particular example since it is clear that every affix spells out a single feature. Note also that an underspecification analysis would not solve the problem. We cannot give the affixes *-de* such a feature-specification that it accounts for its distribution in (7).[4] Carstairs-McCarthy (1998:287) claims that 'the triggering environment for homonymy must be realized simultaneously with the neutralized features'. If that is true, our proposal accounts for that since there is no way in which features realized in a different affix may trigger the non-realization of others. In the rule-based analysis we would need a stipulation such that 'syntagmatic' impoverishment rules (see footnote 2 for an example) are banned.

Second, our approach explains why syncretism is often found in the marked half of a paradigm (cf. Greenberg 1963). For example, in Dutch verbal inflection person is neutralized in the plural, which is marked with respect to singular. The explanation our approach offers is that since UG bans both complex affixes (*COMPLEX) and affixation to already affixed forms (*AFFIX_TO_AFFIX) in the sense that double affixes can only occur if they are required by some higher ranking constraint, neutralization will only occur when two or more morphosyntactic features need to be spelled out. Hence, it will occur in the 'marked' half of the paradigm. For this explanation to go through, we need to make a formal distinction between the 'marked' half of a paradigm and the unmarked half. In our proposal this is done by making use of privative features. The 'unmarked' half of the paradigm thus is simply what is says: not marked. The rule-based theory of Impoverishment has no explanation for this universal tendency.

Third, Halle (1997) has to stipulate that the set of features born by the morpho-phonological VIs is a proper subset of the set of morphosyntactic features. In the proposed theory no such stipulation seems to be necessary: Max-constraints require that features in the (underlying) morphosyntactic representation are spelled-out, while others can be left out. There might also be constraints that prohibit the insertion of features at the morpho-phonological level that are not present in the morphosyntactic representation. Further research is needed to see whether there are cases that can be fruitfully analysed as the insertion of a feature at the morpho-phonologial level that is not morphosyntactically supported.

Notes

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1. The intended rule would be: (i) [+from] → Ø / ___ [+plural] (Carstairs-McCarthy 1998:288), in which [+from] refers to the Ablative/Locative cases.

2. We abstract away from the difference in inflection that is found in the second person singular indicative in so-called 'inversion' contexts.

3. We will use [α person] as an informal notation that ranges over different features that may express 1st, 2nd and 3rd person.

4. An analysis along these lines is the following. Let us assume that Ablative and Locative can be grouped together under the features [+loc; –to]. We may then say that the feature specification of *-de* is [+loc; –to] and the feature specification of *-den* is [+loc.; –to; +from; –plur.] (ablative). However, such an analysis would 'crank out the data' rather than give a proper description, let alone explain anything. Furthermore, pseudo-Turkish would be dealt with as a fusional language in which plural and case-features can be spelled out at the same time.

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