Peter Gallmann University of Jena, Germany

Feature Sharing in DPs*

Version 4.1 E

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1. Hypotheses

In this paper, I attempt to prove the validity of the following hypotheses:

1. Syncretism in affix paradigms is the result of two independent regularities:

On the one hand, certain instances of syncretism can be traced back to constraints that determine which features may be combined in phrase heads. In these cases we are dealing with the interaction of markedness and faithfulness constraints for morphosyntactic features. Combinatorial variants of these constraints (e. g. MAX-[x & y]) seem to be most typical of languages exhibiting portemanteau morphemes. The interaction of such constraints results in an inventory of feature bundles, which does not exhaust all logical possiblities.

On the other hand, the formal expression of the available feature bundles must obey the principle of maximal paradigmatic contrast (Postma 1994: Anti-Agreement). This principle is based on regularities that determine how affix paradigms are stored in the mental lexicon.

2. The distribution of the so-called strong and weak declension of German adjectives depends on the percolation of case features in the NP, and so does the distribution of noun forms with and without case suffixes.

2. Preliminaries

2.1. Remarks on OT

I presuppose the following standard assumptions of Optimality Theory:

- The lexicon provides the input
- For a given input GEN provides an infinite set of output candidates
- EVAL determines the optimal output on the basis of a language particular constraint ranking

As for the lexicon: There are frequent but rather inexplicit references in the literature to the notion of „lexicon optimization“. However, one might want to consider Postma's (1994) constraint on the storage of paradigms with portemanteau morphemes as an instance thereof, cf. section 3.2.

As for EVAL: This component comprises a number of constraint families. The present paper is chiefly concerned with markedness and faithfulness constraints.

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– Faithfulness constraints of the type DEP-x penalize the insertion of features not present in the input. As they are presumed to occupy high positions on the constraint hierarchy in all contexts they will receive relatively little mention in what follows.

– Faithfulness constraints of the type MAX-x penalize the deletion of an input feature x.

  There are also conjoined variants of the MAX-constraints, e. g. MAX-[x & y], abbreviated as MAX-xy in this paper; cf. the method of local conjunction discussed in Legendre / Smolensky / Wilson (1998). I assume that conjoined MAX-constraints are absolute, i.e. it does not matter whether such a constraint is violated partially (e. g. by the lack of only one feature) or totally (by the lack of all features). Both cases result in a simple violation of the conjoined constraint.

– Markedness constraints of the general format *x (= no feature x) prohibit the occurrence of certain features.

  As with faithfulness constraints, the Evaluator component of the grammar, too, provides conjoined variants of markedness constraints, i.e. cooccurrence constraints of the format *[x & y]. However, I will not postulate specific constraints of this type in this paper. Instead, I will use a generalized, quantificational variant of cooccurrence constraints: Restrictions of the type *2 (*3, *4, etc.) prohibit feature bundles of 2 (3, 4, respectively) features of certain feature classes. This type of constraint is scalar, i. e. a bundle of 4 features violates the restriction *2 more severely than a bundle of only 3 features.

Quantificational cooccurrence constraints seem to be typical of languages exhibiting portmanteau morphemes. They delimit the number of available feature bundles and thus allow the morphological component in the lexicon (e. g. affix inventories) to be kept small. Let me give an example: If a cooccurrence constraint *2 outranks a faithfulness constraint MAX-y, a feature bundle xy of the input will always appear as simple x in the output, given that MAX-x is ranked higher than MAX-y. However, if the input only consists of the feature y, this feature will be preserved.

(1) Ranking: *2, MAX-x » MAX-y » *x, *y

(2) OT-Tableau: Possible feature combinations

Input: xy	*2	MAX-x	MAX-y	*x	*y
xy	*!			*	*
→ x			*	*	
y		*!			*
[ ]		*!	x		
Input: x	***2**	**MAX-x**	**MAX-y**	***x**	***y**
→ x				*	
[ ]		*!			
Input: y	***2**	**MAX-x**	**MAX-y**	***x**	***y**
→ y					*
[ ]			*!		

Input: [ ]	*2	MAX-x	MAX-y	*x	*y
→ [ ]					

If we list all combinatorial possibilities of x and y in a table we get the following distribution assuming the above-mentioned ranking:

(3) Table: Permissible feature combinations (cross-classification)

	[ ]	x
[ ]	[ ]	x
y	y	x

In the present paper, I will mainly deal with constraints on morphosyntactic features. Phonological markedness constraints will only be mentioned in passing. See section 7.4.

2.2. On the Structure of Noun Phrases

For the sake of simplicity, I adopt the DP hypothesis of Hellan (1986) and Abney (1987). The analysis presented here can, however, be transferred to the approach of Gallmann (1996 a, 1997), where it was assumed that determiners (or rather articles) occupy the Spec position of the DP, the category D itself being a functional category without any lexical realization. Two points are crucial to the following discussion:

– Determiners are adjectivally inflected; they underlie the same morphological constraints as adjectives.

– Attributive adjective phrases occupy the Spec positions of the NP. (If one adopts the traditional NP analysis, they occupy the Spec positions below the highest Spec position which is reserved for determiners.)

2.3. Gender and Number

As far as gender and number are concerned, I assume the two features [± f] and [± n] which can in principle be combined with each other. Cross-classification yields the system displayed in (4). I follow Wunderlich / Fabry (1995) in assuming that minus values in oppositions like [+ x] vs. [– x] are redundant – at least in morphology. Consequently, a single x invariably stands for [+ x] in what follows whereas [– x] will not be indicated.

(4) Table: Gender/number features (cross-classification)

		n
	[ ] masculine	n neuter
f	f feminine	fn plural

This system is partly simplified due to coocurrence restrictions; cf. the discussion in the following sections. There are several other well-known comparable systems that can be found in the literature.

2.4. Case

Following Müller (2002) I adopt Bierwisch's approach (1967) that is based on a cross-classification of two feature oppositions:

(5) Table: Case features (cross-classification)

		o = oblique
	[ ] nominative	o genitive
g = governed	g accusative	og dative

However, it must be mentioned that not all German data support the claim that the genitive contains fewer features than the dative. Supposing that the nominal inflection is at least partially iconic, the noun *Herz* ('heart') with its case forms *(dem) Herz-en* (dative) and *(des) Herz-en-s* (genitive) suggest an opposite feature system with the dative as [+ oblique] and the genitive as the bundle [+ oblique, + special].

3. Affix Inventory I: Determiners and Strong Adjectives

Adjectival determiners and strong attributive adjectives are inflected in the same way. (On the DP-internal distribution of strong and weak inflection of attributive adjectives cf. section 7.) They inflect with respect to gender/number as well as case. Following the assumptions made above, we come up with a paradigm consisting of 16 cells and consequently an inventory of 16 affixes. However, for the majority of lexemes only 5 affixes can be found in Present-day German. In my view, this remarkable degree of syncretism has two causes: Firstly, the interaction of markedness and faithfulness constraints must be taken into account. As a consequence only a reduced set of inflection forms with certain feature bundles is allowed (section 3.1). It is thus EVAL that holds responsible for this phenomenon. Secondly, we have to consider effects based on regularities that determine how affix paradigms are stored in the mental lexicon (section 3.2).

3.1. Markedness Constraints and Faithfulness Constraints for Feature Bundles

Adjectivally inflected determiners and strong inflected attributive adjectives do not exhibit all morphosyntactic features present in the respective DP. The reduced inventory of feature bundles can be accounted for in the OT framework by means of the following constraint interaction:

1. The simple markedness constraints referring to morphosyntactic features (general format: *x) are ranked lower than any respective MAX-constraint (general format: MAX-x). Therefore, I will not discuss them in this section (but see section 7). Furthermore, I will not consider the respective constraints of the DEP family, as they are ranked higher than any other constraint discussed in this paper.

(6) (DEP-x ») MAX-o » MAX-f » MAX-n » MAX-g (» *x)

2. There are two quantificational cooccurrence constraints, i. e. markedness constraints that restrict feature bundles:

(7) *2 = NO FEATURE DOUBLETS: Syntactic words must not bear more than one feature of the class {n, f, o s} = {[+ neuter], [+ feminine], [+ oblique], [+ governed]}.

(8) *3 = NO FEATURE TRIPLES: Syntactic words must not bear more than two features of the class {n, f, o, s} = {[+ neuter], [+ feminine], [+ oblique], [+ governed]}.

3. Finally, I assume two conjoined faithfulness constraints:

(9) MAX-og = the feature bundle containing the 2 features o and g = [+ oblique, + governed] has to be preserved.

(10) MAX-fnog = the feature bundle containing the 4 features f, n, o, g = [+ feminine, + neuter, + oblique, + governed] has to be preserved.

Note that the quantificational cooccurrence constraints are scalar, whereas the conjoined MAX constraints are absolute (see section 2.1). The constraints presented so far are ranked as in (11):[1]

(11) MAX-fnog » *3, MAX-o » MAX-f » MAX-og » *2, MAX-n « MAX-g

The effect can be gleaned from the table below, which reads as follows: The first row of the cells shows the feature combinations we would expect without cooccurrence constraints. The second row, however, shows the feature combinations actually present. As for the neglection of plural (i. e. the feature bundle fn), see also Wiese (1999). The effect of the cooccurrence constraints is demonstrated in the tableaux (15) to (30).

1 If the genitive is conceived as the feature bundle [+ oblique, + special] (see section 2.4), MAX-fnog has to be replaced by a sequence of three constraints: *4 » MAX-fos » MAX-fno. This constraint system effects an additional feature bundle, namely fos = [+ feminine, + oblique, + special]. The inventory of licensed feature bundles then comprises 9 items. For the sake of simplicity, I will not discuss this approach any further.

(12) Table: Inventory of permissible feature bundles for determiners and strong adjectives

	Masculine	Neuter	Feminine	Plural
Nominative	[ ] [ ]	(n) **n**	(f) **f**	(fn) **f**
Accusative	(g) **g**	(ng) **n**	(fg) **f**	(fng) **f**
Genitive	(o) **o**	(no) **o**	(fo) **fo**	(fno) **fo**
Dative	(og) **og**	(nog) **og**	(fog) **fo**	(fnog) **fnog**

Table (12) shows one of the two sources leading to syncretism. Here, EVAL is the responsible component. The following table clarifies the result of (12). In structuralist terms this is called underspecification with respect to certain oppositions. The analysis advocated here takes underspecification for an epiphenomenon resulting from the interaction of cooccurrence constraints.

(13) Table: Syncretism due to cooccurrence constraints

<table>
<tr><td></td><td>Masculine</td><td>Neuter</td><td>Feminine</td><td>Plural</td></tr>
<tr><td>Nominative</td><td>[ ]</td><td rowspan="2">n</td><td colspan="2" rowspan="2">f</td></tr>
<tr><td>Accusative</td><td>g</td></tr>
<tr><td>Genitive</td><td colspan="2">o</td><td colspan="2" rowspan="2">fo</td></tr>
<tr><td>Dative</td><td colspan="2">og</td><td>fnog</td></tr>
</table>

The 8 feature bundles ideally correspond to 8 inflection affixes. If a paradigm contains more than 8 affixes, we are dealing with synonyms. If, on the other hand, a paradigm contains fewer affixes they must be homonyms. In the latter case we must assume a second source of syncretism, as has been proposed by Wiese (1999) (in a different way). In such cases, we are thus not dealing with underspecification caused by cooccurrence constraints. There is evidence that true homonymy is licensed independently: The principle in effect is the principle of maximal paradigmatic contrast. This principle, however, does hardly belong to the EVAL component of the grammar but rather to the mental lexicon (see section 3.2).

(14) Table: Affix inventory (including homonyms)

	Feature bundles	Affixes (determinierers)	Affixes (adjectives)
1	[ ]	r	r
2	fo	r	r
3	g	n	n
4	fnog	n	n
5	o	s	n
6	n	s	s
7	og	m	m
8	f	e	e

The following tableaux dispense with the DEP-x constraints as well as with the markedness constraints of the format *x. There are no candidats at issue that would be affected by violations of these constraints.

OT-Tableaus (15) to (30): Permissible feature combinations for determiners and strong adjectives

(15) [ ]		MAX-fnog	*3	MAX-o	MAX-f	MAX-og	*2	MAX-n	MAX-g
→	[ ]								
(16) g		MAX-fnog	*3	MAX-o	MAX-f	MAX-og	*2	MAX-n	MAX-g
→	g								
	[ ]								*!
(17) o		MAX-fnog	*3	MAX-o	MAX-f	MAX-og	*2	MAX-n	MAX-g
→	o								
	[ ]			*!					
(18) og		MAX-fnog	*3	MAX-o	MAX-f	MAX-og	*2	MAX-n	MAX-g
→	og						*		
	o					*!			*
	g			*!		*			
	[ ]			*!		*			*
(19) n		MAX-fnog	*3	MAX-o	MAX-f	MAX-og	*2	MAX-n	MAX-g
→	n								
	[ ]							*!	

(20) ng		MAX-fnog	*3	MAX-o	MAX-f	MAX-og	*2	MAX-n	MAX-g
	ng						*!		
	g							*!	
→	n								*
	[ ]							*!	*
(21) no		MAX-fnog	*3	MAX-o	MAX-f	MAX-og	*2	MAX-n	MAX-g
	no						*!		
→	o							*	
	n			*!					
	[ ]			*!				*	
(22) nog		MAX-fnog	*3	MAX-o	MAX-f	MAX-og	*2	MAX-n	MAX-g
	nog		*!				**		
	no					*!	*		*
	ng			*!		*	*		
→	og						*	*	
	n			*!		*			*
	o					*!		*	*
	g			*!		*		*	
	[ ]			*!		*		*	*
(23) f		MAX-fnog	*3	MAX-o	MAX-f	MAX-og	*2	MAX-n	MAX-g
→	f								
	[ ]				*!				
(24) fg		MAX-fnog	*3	MAX-o	MAX-f	MAX-og	*2	MAX-n	MAX-g
	fg						*!		
	g				*!				
→	f								*
	[ ]				*!				*
(25) fo		MAX-fnog	*3	MAX-o	MAX-f	MAX-og	*2	MAX-n	MAX-g
→	fo						*		
	o				*!				
	f			*!					
	[ ]			*!	*				

(26) fog		MAX-fnog	*3	MAX-o	MAX-f	MAX-og	*2	MAX-n	MAX-g
	fog		*!				**		
→	fo					*	*		*
	fg			*!		*	*		
	og				*!		*		
	f			*!		*			*
	o				*!	*			*
	g			*!	*	*			
	[ ]			*!	*	*			*
(27) fn		MAX-fnog	*3	MAX-o	MAX-f	MAX-og	*2	MAX-n	MAX-g
	fn						*!		
→	f							*	
	n				*!				
	[ ]				*!			*	
(28) fng		MAX-fnog	*3	MAX-o	MAX-f	MAX-og	*2	MAX-n	MAX-g
	fng		*!				**		
	fn						*!		*
	fg						*!	*	
	ng				*!		*		
→	f							*	*
	n				*!				*
	g				*!			*	
	[ ]				*!			*	*
(29) fno		MAX-fnog	*3	MAX-o	MAX-f	MAX-og	*2	MAX-n	MAX-g
	fno		*!				**		
	fn			*!			*		
→	fo						*	*	
	no				*!		*		
	f			*!				*	
	n			*!	*				
	o				*!			*	
	[ ]			*!	*			*	

(30) fnog		MAX-fnog	*3	MAX-o	MAX-f	MAX-og	*2	MAX-n	Max-g
	fnog		**				***		
	fno	*	*			*	**		*
	fng	*	*	*		*	**		
	fog	*	*				**	*	
	nog	*	*		*		**		
	fn	*		*		*	*		*
→	fo	*				*	*	*	*
	fg	*		*		*	*	*	
	no	*			*	*	*		*
	ng	*		*	*	*	*		
	og	*			*		*	*	
	f	*		*		*		*	*
	n	*		*	*	*			*
	o	*			*	*		*	*
	g	*		*	*	*		*	
	[ ]	*		*	*	*		*	*

3.2. Memory-Based Homonymy

3.2.1. Theoretical Background

To my knowledge, there are only few studies attempting to shed light on the question how affix paradigms are stored in the mental lexicon, one of which is by Postma (1994). Postma studied the person/number inflection of the verb in various languages. He observed phenomena of partial or complete homonymy in the affix inventory and in the stem allomorphy in many languages. A considerable part of these phenomena cannot be explained by the traditional means of underspecification as two affixes can be fully or nearly identical even if they share no common feature; cf. (31):

(31) German verb inflection, person/number affixes of indicative present tense:
a. *-t* = 3rd person singular (*er mach-t* = 'he makes')
b. *-t* = 2nd person plural (*ihr mach-t* = 'you make')

Postma (1994) made a remarkable proposal to explain such phenomena. It applies only to languages with portmanteau morphemes, e. g. to the inflecting languages of the Indo-European type. Postma proposes that person/number paradigms of such languages have to be arranged in a circular way. The forms in the opposite paradigm cells must in each case contrast maximally with respect to the morphosyntactic features (in Postma' terms: anti-agreement):

(32) The principle of maximal paradigmatic contrast (my formulation):
Maximally distant paradigm cells have maximally different morphosyntactic features.

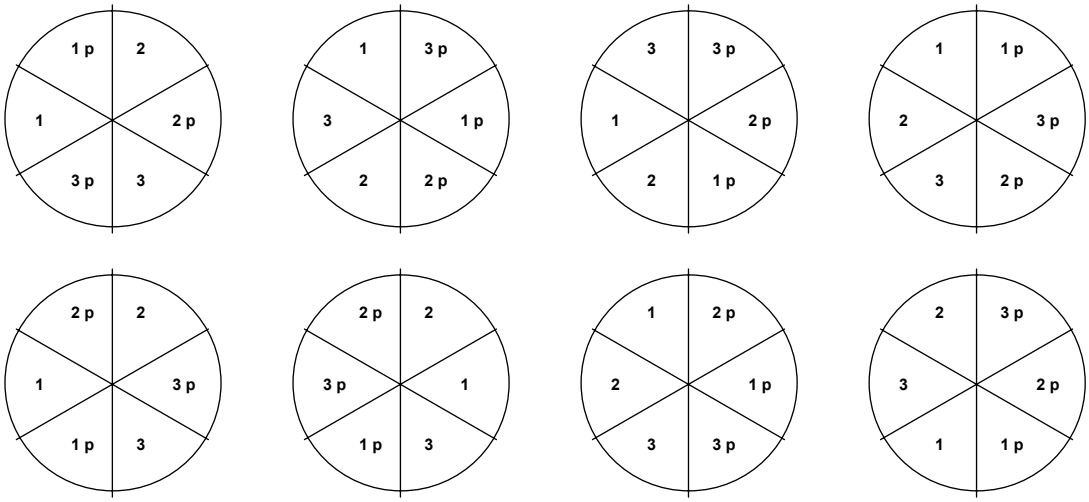
Adjacent paradigm cells may agree in phonological and/or in morphosyntactic features. Non-adjacent paradigm cells, however, must not share phonological features if there are intervening cells with different phonological features. (Note that this regularity does not apply to

morphosyntactic features, i. e., two non-adjacent paradigm cells that share certain morphosyntactic features can be separated by cells with incompatible features.)

The circular arrangement seems to be derivable from conditions controlling the mechanisms how inflectional items are stored in the mental lexicon. These conditions are different from those occurring in agglutinative languages. Postma therefore hopes to have found a diagnostic to distinguish inflection and agglutination.

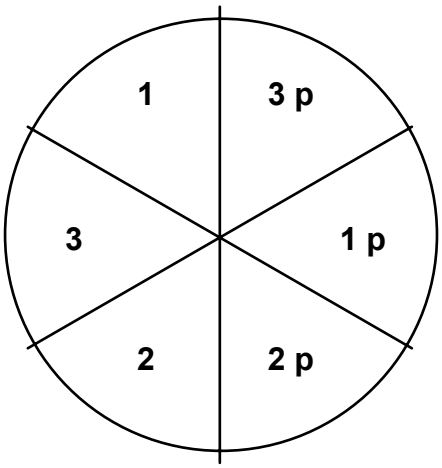
As for the person/number inflection of the verb, six feature combinations are of importance; the respective paradigms are thus composed of six cells. There are eight arrangements that obey Postma's principle of maximal paradigmatic contrast. See the diagrams in (33):

(33) Diagrams: All circular paradigms obey Postma's principle of maximal paradigmatic contrast. Abbreviations: 1, 2, 3 = 1st, 2nd, 3rd person (the last being redundant), p = plural.



Postma proved his proposal on several languages. Most exhaustively, he investigated the inflectional systems of Italian and Dutch. As for Italian, he demonstrated that the paradigm of indicative present tense follows the scheme (34):

(34) Circular Paradigm of Italian (person and number inflection of indicative present tense):



I want to illustrate the efficiency of the diagram by a simple example, the verb *tenere* (= 'to hold'). Table (35) presents the inflectional forms of this verb in the traditional arrangement:

(35)

1st person singular	*tengo*
2nd person	*tieni*
3rd person	*tiene*
1st person plural	*teniamo*
2nd person	*tenete*
3rd person	*tengono*

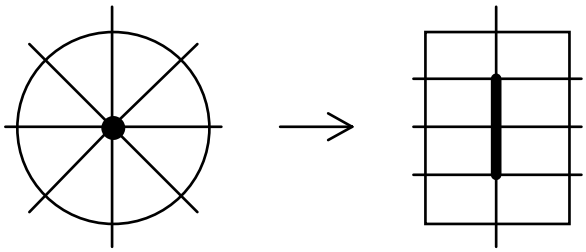
Many inflectional forms share phonological properties with other forms. Some of them can be derived by means of underspecification. The circular paradigm (34), however, enables Postma to explain all phonological similarities between the word forms. The forms *tengo* and *tengono* are most instructive as they share no morphosyntactic features. They are, however, adjacent in Postma's circular paradigm (34):

(36) a. Diphthongization in the stem: *tieni, tiene*
b. Unstressed monophthong in the stem: *teniamo, tenete*
c. Allomorph *teng-: tengo, tengono*
d. Simple vocalic affixes: *teng-o, tien-i, tien-e*
e. Affixes with a sonorant: *teniamo, tengono*

3.2.2. Application of Postma's Model to the Strong Inflection of Determiners and Adjectives

A technical remark in advance: For technical reasons, the circle-shaped paradigms appear "squeezed" into tables in the following discussion. They can, however, be read in the same way as Postma's circle diagrams: We only have to keep in mind that maximal distance has to be interpreted in a radial symmetric way. Consequently, neighbourhood does not hold for two adjacent medial cells (hence the bold line). For instance:

(37) The representation of paradigms:



As for the inflection of determiners and strong adjectives in German, we can find a constellation where Postma's principle of maximal paradigmatic contrast is respected. Interestingly, the affixes which are formally identical are all side by side even if the have none or only some morphosyntactic features in common.

(38) Table: Affix paradigm (basic pattern)

-s	[n]	**-s**	[o]
-r	[ ]	-n	[g]
-r	[fo]	-n	[fnog]
-e	[f]	-m	[og]

Important paradigms of German:

(39) Table: *der, die, das* (= 'the') followed by a noun

das	[n]	**des**	[o]
der	[ ]	den	[g]
der	[fo]	den	[fnog]
die	[f]	dem	[og]

(40) Table: *kein* (= 'no'; similarly: *ein* = 'a', 'one' as well as possessive pronouns) if followed by a noun

kein	[n]	keines	[o]
kein	[ ]	keinen	[g]
keiner	[fo]	keinen	[fnog]
keine	[f]	keinem	[og]

On a more detailed analysis of *kein* see section 7.3.

(41) Table: Indefinite pronoun *jeder* (= 'every', 'each')

jedes	[n]	**jedes** jeden	[o]
jeder	[ ]	jeden	[g]
jeder	[fo]	–	[fnog]
jede	[f]	jedem	[og]

(42) Table: Ordinary strong adjective (*gut* = 'good')

gutes	[n]	guten	[o]
guter	[ ]	guten	[g]
guter	[fo]	guten	[fnog]
gute	[f]	gutem	[og]

In sum, we can state that the German affix inventory can be appropriately explained by the interaction of cooccurrence restrictions on the one hand and by Postma's principle of maximal contrast on the other.

4. Affix Inventory II: Weak Adjective

Similar to what has been said about strong adjectives and determiners, again two sources of syncretism can be found in the case of weak adjectives. The sources are again a) underspecification as the result of cooccurrence constraints and b) Postma's principle of maximal paradigmatic contrast. EVAL is responsible for the former kind of syncretism whereas the mental lexicon holds responsible for the latter.

The crucial difference between the strong and the weak adjectives is that in the latter case no feature bundles are allowed except for plural = [fn]. This is achieved by a high ranked specific version of the cooccurrence constraint *2, which I will call *2(weak). The preservation of the feature bundle for plural is effected by a higher ranked specific faithfulness constraint. This constraint applies not only to weak adjectives, but also to nouns (see section 5.1):

(43) MAX-fn(w/n) = The feature bundle [+ feminine, + neuter] (= plural) of weak adjectives or nouns must be preserved.

We then obtain the following hierarchy (the newly introduced constraints are in boldtype):

(44) **MAX-fn(w/n)** » ***2(weak)** » MAX-fnog » *3, MAX-o » MAX-f » MAX-og » *2, MAX-n » MAX-g

For reasons of space, I dispense with a detailed demonstration of (44). As a global result, it leads us to the inventory described in (45):

(45) Table: Inventory of permissible feature bundles for weak adjectives

	Masculine	Neuter	Feminine	Plural
Nominative	[ ] [ ]	(n) **n**	(f) **f**	(fn) **fn**
Accusative	(g) **g**	(nr) **n**	(fr) **f**	(fnr) **fn**
Genitive	(o) **o**	(no) **o**	(fo) **o**	(fno) **fn**
Dative	(or) **o**	(nor) **o**	(for) **o**	(fnor) **fn**

This produces an inventory consisting of 6 potential affixes.

(46) Table: Syncretism due to cooccurrence constraints

	Masculine	Neuter	Feminine	Plural
Nominative	[ ]	n	f	fn
Accusative	g			
Genitive	o			
Dative				

The actual inventory of German, however, consists of only two sets of truly homonymous affixes. The reason for this homonymy can be found in Postma's principle of maximal paradigmatic contrast:

(47) Table: Paradigm of weak adjective inflection

gut-e	[ ]	gut-en	[o]
gut-e	[n]	gut-en	[g]
gut-e	[f]	gut-en	[fn]

However, the picture devoloped so far is somewhat misleading. If we compare the affix inventories of the strongly and the weakly inflected adjective, we detect that there are almost no pairs of feature bundles that differ only in the inflection class, i.e. with respect to the opposition strong vs. weak. This oberservation suggests that the traditionally assumed strong and weak paradigms do not result from two independent affix inventories, but from the constraint system that allows only specific feature bundles in a given context. Therefore, the following general affix inventory for determiners and attributive adjectives can be drawn up:

(48) Table: Unified affix inventory of adjectives and adjectivally inflected determiners (with homonyms)

	feature bundles	affixes
1	[ ]	r
2	[fo]	r
3	[g]	n
4	[fn]	n
5	[fnog]	n
6	[o]	n
7	[n]	s
8	[og]	m
9	[f]	e
10	$[\ ]_w$	e
11	$[n]_w$	e

There are two oppositions left that involve inflection class: row 1 vs. row 10 and row 7 vs. row 11 in table (48). However, this kind of opposition disappears completely if we follow the proposal of Ortmann (2002: 49–96). Ortmann assumes that modifying adjectives (and other modifying attributes) are introduced by a specific functional category – let us call it W. This category has morphological reflexes in several languages. German seems to belong to these languages. Here, we can assume a morphosyntactic feature [w] (= weak) referring to the functional category W. The occurrence of the [w] feature is controlled by the constraint hierarchy (49) which differs from (44) only in that MAX-w is added):

(49) MAX-fn(w/n) » *2(weak) » MAX-fnog » *3, MAX-o » MAX-f » MAX-og » *2 » **MAX-w** » MAX-n » MAX-g

Assuming the constraint system in (49), we can dispense with [ ]$_w$ and [n]$_w$. Instead, the feature [w] appears in the respective contexts. There is only one problematic issue: The constraint ranking (49) disallows the feature [g] of the masculine accusative (in traditional terms). However, this feature is obtained by the constraint SPREAD-g automatically without any modification; see (110) in section 7.3.

The resulting unified affix inventory can be explained by Postma's principle of maximal paradigmatic contrast very well:

(50) Table: Unified affix paradigm of attributive adjectives and adjectivally inflected determiners

r	[ ]	s	[n]
r	[fo]	n / s	[o]
e	[w]	n	[fn]
e	[f]	n	[g]
m	[og]	n	[fnog]

Conclusion: The traditional assumption of two separate adjectival inflection paradigms is unnecessary. They can be explained as an epiphenomenon resulting from the German constraint system that disallows certain feature cooccurrences in the respective contexts.

In the sections below, I omit the feature [w] and the constraint Max-w for the sake of simplicity.

5. Affix Inventory III: Nouns

As has been shown with determiners and adjectives, noun inflection, too, requires a distinction between syncretism caused by Eval (underspecification) and syncretism caused by the way affixes are stored in the mental lexicon.

5.1. EVAL-Based Inventory of Feature Bundles

The following feature bundles are allowed for nouns:

(51) Table: Inventory of permissible feature bundles for nouns

	Masculine	Neuter	Feminine	Plural
Nominative	[ ]	n	f	fn
Accusative	g	n	f	fn
Genitive	o	o	f	fn
Dative	og	og	f	fnog

This leads us to an inventory of eight feature bundles. It can be obtained by the constraint system developed so far. We need, however, one additional assumption concerning the faithfulness constraint MAX-o. The hierarchical position of this constraint given in (11) and (44)

applies only to determiners and adjectives. Therefore, MAX-o must be replaced by a specific variant MAX-o(A), whereas the unspecific constraint MAX-o which is also applicable to nouns is ranked below the cooccurrence constraint *2:

(52) MAX-fn(w/n) » *2(weak) » MAX-fnog » *3, » **MAX-o(A)** » MAX-f » MAX-og » *2, **MAX-o** » MAX-n » MAX-g

As in the case of the weak adjective, I dispense with a detailed demonstration of the above constraints for reasons of space.

5.2. Memory-Based Homonymy

The inventory of eight feature bundles results in a virtual paradigm of eight cells. A single lexeme, however, cannot occupy all of them since German nouns have a fixed gender. Consequently, some cells remain empty. Adhering to Postma's principle of maximal paradigmatic contrast, the following general pattern can be assumed:

(53) General pattern of the German noun inflection

f	og
[ ]	fn
g	fnog
n	o

The examples below illustrate all morphologically interesting paradigms of the German noun inflection.

(54) Masculine (strong) I (*Turm* = 'tower')

	f	Turm-e	og
Turm	[ ]	Türm-e	fn
Turm	g	Türm-e-n	fnog
	n	Turm-s	o

(55) Masculine (strong) II (*Spiegel* = 'mirror')

	f	Spiegel	og
Spiegel	[ ]	Spiegel	fn
Spiegel	g	Spiegel-n	fnog
	n	Spiegel-s	o

(56) Masculine (strong) III (*Balken* = ‘beam, girder)

	f	Balken	og
Balken	[ ]	Balken	fn
Balken	g	Balken	fnog
	n	Balken-s	o

(57) Masculine (weak) (*Bote* = ‘carrier’)

	f	Bot-en	og
Bot-e	[ ]	Bot-en	fn
Bot-en	g	Bot-en	fnog
	n	Bot-en	o

(58) Neuter (strong) (*Auto* = ‘car’)

	f	Auto	og
	[ ]	Auto-s	fn
	g	Auto-s	fnog
Auto	n	Auto-s	o

(59) Neuter (weak) (*Herz* = ‘heart’)

	f	Herz-en	og
	[ ]	Herz-en	fn
	g	Herz-en	fnog
Herz	n	Herz-en-s	o

(60) Feminine (strong) (*Nuss* = ‘nut’)

Nuss	f		
		Nüss-e	fn
		Nüss-e-n	fnog

(61) Feminine (weak) (*Tasche* = ‘bag’)

Tasche	f		
		Tasch-en	fn
		Tasch-en	fnog

6. Provisional Results

In the preceding sections, the following constraint ranking could be established:

(62) MAX-fn(w/n) » *2(weak) » MAX-fnog » *3 » MAX-o(A) » MAX-f » MAX-og » *2, MAX-o » MAX-n » MAX-g

Some particularities may be worth mentioning:

– The basic ranking of faithfulness constraints can be described as MAX-f » MAX-o » MAX-n » MAX-g.

– Deviations from this system concern the plural and the oblique case feature: Nouns and weak adjectives preserve the feature bundle fn = Plural especially, whereas adjectives (weak and strong ones) do not tolerate violations of MAX-o.

– The dative case is preserved particularly well by conjoined faithfulness constraints (MAX-og, MAX-fnog).

7. Percolation in the NP

7.1. Basic Rules

Earlier works of mine (Gallmann 1990, 1996 a, 1997, 1998) have connected the distribution of strong and weak adjective forms relatively directly to the functional category D. In Gallmann (1996 a, 1997, 1998), I explained it predominantly by means of Spec-Head-Agreement. In the present paper, I will, in a modified way, return to the analysis advocated in Gallmann (1990). In accordance with recent work (e.g. Schürcks/Wunderlich 2001), I assume that morphosyntactic features may percolate from a maximal projection to the specifier position or to complement phrases. Further, I follow Müller (2002) and Gallmann (1996 a) in assuming that attributive adjectives occupy specifier positions.

I state the following hypothesis:

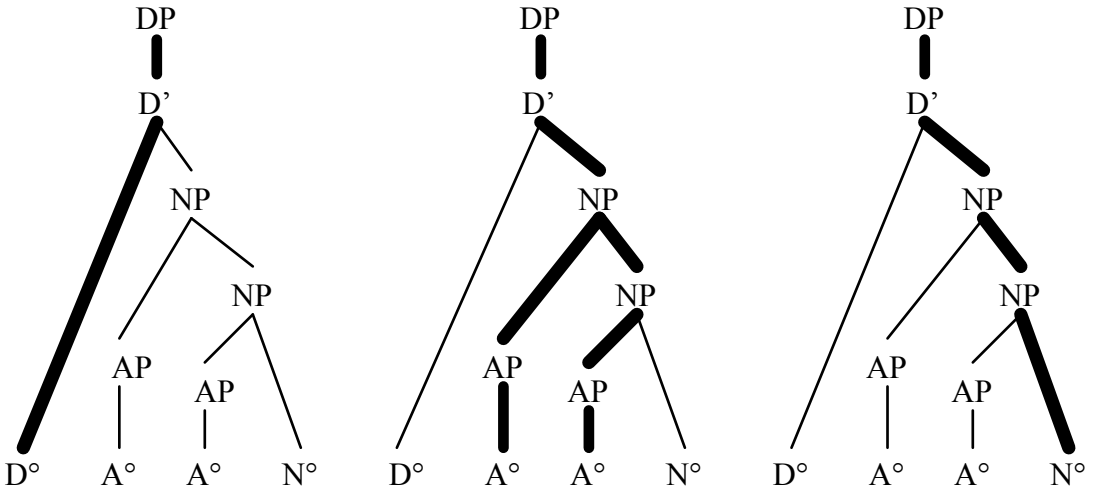
(63) Case percolation in the DP:
a) DP – D°
b) *or* DP – NP – AP – A°
c) *or* DP – NP – N°
One of these three options is selected as *main percolation line.* [2]

[2] In the framework of Minimalist Morphology (Wunderlich / Fabri 1995, Ortmann 2002), the concept of the main percolation line can be substituted on the following assumptions:

1. Functional categories can co-project with lexical ones.
2. Determiners and strongly inflected adjectives are combinations of the categories A and D.
3. Under certain circumstances, nouns, too, can co-project with D. In this case, they are categorically complex items of the type D+N.

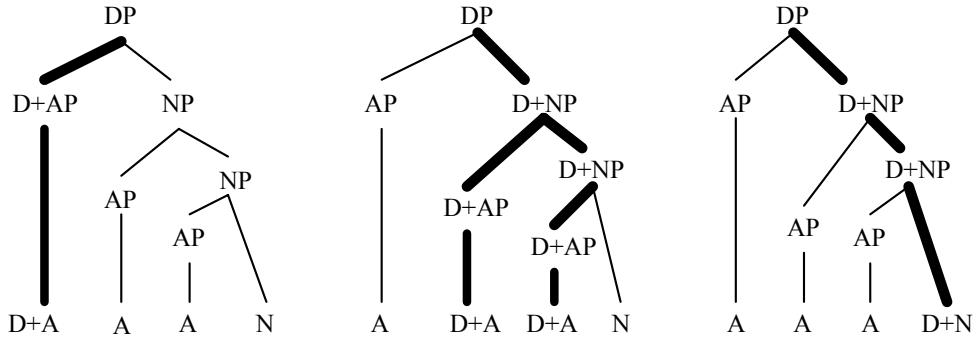
On these assumptions, the following constellations can be derived:

(64) Diagrams: 3 options to determine the main percolation line for case



The DP is assigned case from outside and it percolates from the maximal projection to the appropriate heads. Gender and (usually) number, however, are inherent features of the word form in N°. Gender/number features thus project from N° onto the maximal projections NP and DP and from there they percolate to the D and A heads. Consequently, we can do without Spec-Head-Agreement as far as case and gender/number features are concerned. In addition, this explains why determiners, adjectives, and nouns do not always show the same feature bundles (due to different cooccurrence constraints, cf. the sections 3 to 0). Consider the examples below: (65 a) shows a DP in the dative singular (assumed feature combination of the whole DP: fog). The DP in (65 b) is in the accusative plural (feature combination: fng). The individual heads bear only part of the features of the DP.

(65) a. Ich stand in [$_{DP[fog]}$ einer$_{[fo]}$ alten$_{[o]}$ Burg$_{[f]}$]
('I stood in an old castle')
b. Ich besuchte [$_{DP[fng]}$ diese$_{[f]}$ alten$_{[fn]}$ Burgen$_{[fn]}$]
('I visited these old castles')



Compare the analysis of Ortmann (2002: 27–45) investigating languages of South-Eastern Europe and the independently developed analysis of Gallmann (1990) on German. In the framework of Minimalist Morphology, all constraints related to the main percolation line can be replaced by constraints that control the co-projection of the functional category D.

For the sake of compatibility with other theoretical frameworks, the following discussion is based on the concept of main percolation line.

We can observe the following correlations between the selection of the main percolation line for case and the inflection of determiners, attributive adjectives and nouns:

(66) Adjectivally inflected determiners
   a) A determiner at the end of a main percolation line inflects strongly.
   b) Otherwise, it does not inflect at all.

(67) Attributive adjectives
   a) An attributive adjective at the end of a main percolation line inflects strongly.
   b) Otherwise, it inflects weakly.

(68) Noun
   a) A noun at the end of a main percolation line does not inflect for case.
   b) Otherwise, it inflects for case.

The hypothesis (63) and the observations (65) to (68) can be incorporated into the model developed so far. For the formulation of the constraints, I will use the "pseudo"-feature M (= main percolation line for case). Clearly, M is not a morphosyntactic feature but describes a structural property. The basic condition can be put as follows:

(69) M (CASE) = Main Percolation Line for Case: Appoint at least one head of the categories D, A or N as the end of the main percolation line.

The constraint (70) is a more specific variant of (69):

(70) LEFTMOST M = The leftmost head is at the end of the case main percolation line.

These constraints have a scalar markedness constraint as counterpart. It aims at minimizing the number of percolation lines within the DP:

(71) *M = No Main Percolation Line (Case)

Words with adjectival inflection within the NP are furthermore subject to a correspondence constraint. On the status of this constraint see Müller (2002) where an equivalent constraint ADJCOR (Adjective Correspondence) is discussed.

(72) PARALLEL (NP, A-INFL) = Adjectivally inflected words within the NP agree on the feature M.

The following constraint refers to the observation (68 a):

(73) *o/g(N_M) = A nominally inflected word at the end of a main percolation line (= marked M) must not have any case features.

This restriction is a conjoined markedness constraint or cooccurrence constraint involving a class of morphosyntactic features and a structural property. It can be divided into two more elementary constraints; however, these play no autonomous role in the following discussion:

(74) *o (N_M) = A nominally inflected word at the end of a main percolation line (= marked M) must not have the feature [+ oblique].

(75) *g (N_M) = A nominally inflected word at the end of a main percolation line (= marked M) must not have the feature [+ governed].

The constraints postulated so far in this section are ranked as in (76):

(76) M (CASE) » *o/g (N_M) » PARALLEL » LEFTMOST M » *M

The tableaux below show how the constraints postulated interact. The structures of the NPs are prototypical.

Tableaux(77) to (79): Assignment of the morphosyntactic main percolation line (*dieser dicke gute Roman* = 'this thick good novel'; *dicke gute Romane* = 'thick good novels'; *Annas dicker guter Roman* = 'Ann's thick good novel'):

(77)	NP = [ ] dies… dick… gut… Roman	M (CASE)	*o/g (N_M)	PAR- ALLEL	LEFT- MOST M	*M
→	$dieser_M$ dicke gute Roman					*
	$dieser_M$ $dicker_M$ gute Roman			*!		**
	$dieser_M$ $dicker_M$ $guter_M$ Roman					**!*
	$dieser_M$ $dicker_M$ $guter_M$ $Roman_M$					**!**
	dies $dicker_M$ $guter_M$ Roman				*!	**
	dies $dicker_M$ gute Roman			*!	*	*
	dies dicke gute Roman	*!			*	
(78)	NP = [fn] dick… gut… Romane	M (CASE)	*o/g (N_M)	PAR- ALLEL	LEFT- MOST M	*M
	$dicke_M$ $gute_M$ $Romane_M$					***!
→	$dicke_M$ $gute_M$ Romane					**
	$dicke_M$ guten Romane			*!		*
	dicken $gute_M$ Romane			*	*!	*
	dicken guten Romanen	*!			*	
(79)	NP = [ ] (Annas) dick… gut… Roman	M (CASE)	*o/g (N_M)	PAR- ALLEL	LEFT- MOST M	*M
	(Annas) $dicker_M$ $guter_M$ $Roman_M$					***!
→	(Annas) $dicker_M$ $guter_M$ Roman					**
	(Annas) $dicker_M$ gute Roman			*!		*
	(Annas) dicke $guter_M$ Roman			*!	*	*
	(Annas) dicke gute $Roman_M$				*!	
	(Annas) dicke gute Roman	*!			*	

In the third example, *Annas* (= Ann's) it treated as an independent, autonomous DP. Alternatively, it is often assumed that prenominal forms like this one are conversions into a determiner (Lindauer 1995, Demske 2000). In this case, the analysis proposed for determiners such as *manch* ('many') must be taken into account; see (108).

In the following sections, I will discuss some phenomena which can be derived from interactions with the constraints postulated in the sections 3 to 6:

– Loss of case (for nouns)
– Dative plural
– Genitive singular
– NPs with determiners of the type *ein, kein, mein*
– *-em/-en* variation in the dative singular

7.2. Nouns With and Without Case Markers

It is due to the constraint (73), *o/g (N_M), that nominal heads at the end of a morphosyntactic main percolation line do not have any case affixes. This is only possible on the condition that *o/g (N_M) dominates the MAX-constraints for case discussed in sections 3 to 0 (except MAX-fnog; see below). See the ranking of MAX-g in the following examples.

Tableaux: Nouns and morphosyntactic main percolation line (*ohne Dirigent* = 'without conductor'; *ohne eigenen Dirigenten* = 'without own conductor'):

(80)	DP = [g] (ohne) Dirigent…	M (CASE)	*o/g (N_M)	MAX-g	PAR- ALLEL	LEFT- MOST M	*M
	(ohne) Dirigent	*!		*		*	
→	(ohne) Dirigent_M			*			*
	(ohne) Dirigenten	*!				*	
	(ohne) Dirigenten_M		*!				*
(81)	DP = [g] (ohne) eigen… Dirigent…	M (CASE)	*o/g (N_M)	MAX-g	PAR- ALLEL	LEFT- MOST M	*M
	(ohne) eigenen_M Dirigent_M			*!			**
	(ohne) eigenen Dirigent_M			*!		*	*
→	(ohne) eigenen_M Dirigenten						*
	(ohne) eigenen_M Dirigenten_M		*!				**
	(ohne) eigenen Dirigenten	*!				*	

In case of the dative suffix *-e,* we find a similar effect (this is of course only true for speakers that still use this ending):

(82) a. aus hartem_M Holze
('of hard wood')
b. aus $*\text{Holze}_M$
('of wood')

Not only is the fact that German has a constraint of the type *o/g (N_M) at all rather unexpected but it is probably also typologically rare. DPs of the type shown in (80) are yet by no means caseless. This can be demonstrated if we take DP-DP agreement into consideration:

(83) a. Als $[_{\text{Dative}}$ gutem Zuhörer$]_i$ fiel Prof. Meiers $[_{\text{Dative}}$ Assistent$]_i$ der Misston auf
('As good listener, Prof. Meyer's assistent became aware of the dissonance')
b. Er hat mit $[_{\text{Dative}}$ Holz] gearbeitet, $[_{\text{Dative}}$ diesem universellen Werkstoff]
(He worked with wood, this universal material')

Nominalized adjectives and adjectivally inflected lexemes pattern like adjectives and are thus regarded as adjectives (Stechow/Sternefeld 1988). Consequently, *o/g (N_M) does not apply.

(84) a. Dem_H Neuen von Anna gehört angeblich ein Schloss
b. Annas Neuem_H gehört angeblich ein Schloss
(Both: 'Ann's new partner allegedly owns a castle')

(85) a. die Einstellung dieser$_M$ Beamten
('the engagement of these officials')
b. die Einstellung allerlei Beamter$_M$
('the engagement of several officials')

In the standard variety of the German language, MAX-fnog (Dative plural) is ranked higher than *o/g (N_M). See the following tableaux.

Tableaux on the dative plural (*mit Früchten* = 'with fruits'; *mit tropischen Früchten* = 'with tropical fruits'):

(86)	DP = [fnog] mit Früchte…	M (CASE)	MAX- fnog	*o/g (N_M)	PAR- ALLEL	LEFT- MOST M	*M
	mit Früchte	*!	*			*	
	mit Früchte$_M$		*!	*			*
	mit Früchten	*!				*	
→	mit Früchten$_M$			*			*
(87)	DP = [fnog] mit tropisch… Früchte…	M (CASE)	MAX- fnog	*o/g (N_M)	PAR- ALLEL	LEFT- MOST M	*M
	mit tropischen$_M$ Früchte$_M$		*!				**
	mit tropischen$_M$ Früchte		*!				*
	mit tropischen Früchte$_M$		*!			*	*
	mit tropischen Früchte	*!	*			*	
	mit tropischen$_M$ Früchten$_M$			*!			**
→	mit tropischen$_M$ Früchten						*
	mit tropischen Früchten$_M$			*!		*	*
	mit tropischen Früchten	*!				*	

In German, there is a tendency to order MAX-fnog along with the other MAX constraints for case, i. e. lower than *o/g (N_M). We would then expect forms without the dative plural suffix *-n*. Indeed, such affixless forms do occur. In a quick search by means of the internet service "google", I found that about 20 % of the occurrences of the phrase *mit Kindern* ('with children') lacked the case suffix (i. e.: *mit Kinder*) (January 2003). Such forms are, however, not approved in prescriptive grammars. But even Duden 1 (2000), doubtlessly the best known custodian of the norm, notes under the entry *Land* ("country'):

(88) aus aller Herren Länder (besides: aus aller Herren Ländern)
('out of all rulers' countries')

The genitive suffix *-s* is not entirely comparable to the dative suffix *-n*. As a rule, it occurs only where there is no violaton of *o/g (N_M). Consequently, *-s* forms are impossible if the noun of the NP is at the end of the case main percolation line. In other words, NPs without an article or an attributive adjective do not exhibit the suffix.

(89) a. * der Genuss Wassers$_M$
('the consumption of water')
b. * Er enthielt sich Widerstands$_M$
('He abstained from resistance')

Considering the ungrammaticality of the instances in (89), one may now expect suffixless forms. In genitive phrases, however, syntactic visibility constraints play a crucial role. It is because of these constraints that affixless forms, too, are ungrammatical – otherwise, the second candidate in (90) would have won.

In the tableaux below only MAX-o – as it is relevant for the genitive – is included (*der Genuss Wassers* = 'the consumption of water'; *der Genuss kalten Wassers* = 'the consumption of cold water'):

(90)	DP = [o] (der Genuss) Wasser…	M (CASE)	*o/g (N_M)	Max-o	PAR- ALLEL	LEFT- MOST M	*M
	(der Genuss) Wasser	*!		*		*	
(→)	(der Genuss) $Wasser_M$			*			*
	(der Genuss) Wassers	*!				*	
	(der Genuss) $Wassers_M$		*!				*
(91)	DP = [o] (der Genuss) kalt… Wasser…	M (CASE)	*o/g (N_M)	Max-o	PAR- ALLEL	LEFT- MOST M	*M
	(der Genuss) $kalten_M$ $Wasser_M$			*!			**
	(der Genuss) $kalten_M$ Wasser			*!			*
	(der Genuss) kalten $Wasser_M$			*!		*	*
	(der Genuss) kalten Wasser	*!		*		*	
	(der Genuss) $kalten_M$ $Wassers_M$		*!				**
→	(der Genuss) $kalten_M$ Wassers						*
	(der Genuss) kalten $Wassers_M$		*!			*	*
	(der Genuss) kalten Wassers	*!				*	

At least one specific variant of MAX-o has remained from an earlier stage of the German language: MAX-o (PRESTIGE). This constraint is ranked as MAX-fnog.

(92) MAX-o (PRESTIGE)

PPs containing a prestigious preposition (i.e. a preposition that is encountered in literary texts) must preserve the feature o = [+ oblique].

In the following examples, the percentage symbol % indicates stylistic markedness:

(93) a. % wegen Todesfalls geschlossen
('closed because of a case of death')
b. % mittels Drahtes (Duden 9, 2001)
('by means of wire')

However, inflected noun forms are hardly ever found when they are accompanied by prepositions typical of non-literary texts:

(94) a. ??? abzüglich Rabatts
('minus discount')
b. ??? einschließlich Verpackungsmaterials
('including packing material')

A similar, yet stylistically less marked constraint of the MAX-o family can be assumed for articleless proper names.

7.3. Special Case I: Determiners of the Type *ein, kein, mein*

There is a subclass of determiners in German that do not inflect:

(95) a. *ein, irgendein* ('a/one', 'some')
b. *kein* ('no')
c. Possessive determiners: *mein, dein, sein, ihr, unser, euer* ('my', 'your', 'his' etc.)

The special behaviour of these determiners can be explained by a lexeme-specific constraint:

(96) *M (D, *ein*) = Determiners of the lexical class *ein (kein, mein ...)* must not be at the end of a main percolation line.

In (97), the determiner *ein* ('a') cannot bear the inflectional affix *-er*. This contrasts with the determiner *dies-er* ('this') in (98):[3]

(97) a. [Ein dick-er gut-er Roman] liegt auf dem Tisch.
b. * [Ein-er dick-e gut-e Roman] liegt auf dem Tisch.
(Both: 'A thick good novel is on the table.')

(98) a. * [Dies dick-er gut-er Roman] liegt auf dem Tisch.
b. [Dies-er dick-e gut-e Roman] liegt auf dem Tisch.
(Both: 'This thick good novel is on the table.')

The constraint *M (D, *ein*) is violated in certain contexts (*e* = empty head N°):

(99) a. Dieses Zitat stammt aus *[ein dickem gutem Roman]
b . Dieses Zitat stammt aus [ein-em dick-en gut-en Roman]
(Both: 'This quotation is from a thick good novel.')

(100) a. Das ist nicht [dein Roman], sondern *[mein *e*]
b. Das ist nicht [dein Roman], sondern [mein-er *e*]
(Both: 'This is not your novel, but mine.')

(101) a. Das hat *[kein *e*] gesehen
b. Das hat [kein-er *e*] gesehen[4]
(Both: 'Nobody has seen that.')

---

[3] The short variant *dies* ('this', nominative/accusative singular neuter) for *dieses* must be interpreted as *dies-s*. It does not count as an affixless form. See the following examples:
(i) a. $dies_M$ dicke Buch
b. *$dies\ dickes_M$ Buch
(Both: 'this thick book')

[4] In German, there is a class of nominally inflected pronouns (Heidolph 1981; Gallmann 1990, 1996 b). These pronouns can be at the end of a main percolation line and bear no inflectional affixes in the nominative, accusative and dative:

(i) Ich habe *allerlei* erlebt.
('I have experienced all sorts of things.')

Note that certain lexemes have both nominally and adjectivally inflected forms (Gallmann 1996 b):

(ii) a. Anna hat schon *viel* erlebt.
b. Anna hat schon *vieles* erlebt.
(Both: 'Ann has experienced much.')

These data can be accounted for by the position von *M (D, *ein*): It is ranked below the cooccurrence constraint *2:

(102) M(Case) » MAX-fn(w/n) » *2(weak) » MAX-fnog » *o/g(N_M) » *3, » MAX-o(A) » MAX-f » MAX-og » *2 » ***M (D, *ein*)** » MAX-o » MAX-n » MAX-g » PARALLEL » LEFTMOST M » *M

In the following tableaux, only those constraints are listed that are crucial for the phenomena discussed here (*ein*... *dick*... *Roman* = 'a thick good novel'; *mein*... = 'my/mine').

(103)	DP = [ ] ein… dick… gut… Roman	M (Case)	Max-o (A)	Max-og	*M (ein)	Max-o	Max-g	Par-allel	Left-most M	*M
	$einer_M$ dicke gute Roman				*!					*
	$einer_M$ $dicker_M$ gute Roman				*!					**
	$einer_M$ $dicker_M$ $guter_M$ Roman				*!					***
→	ein $dicker_M$ $guter_M$ Roman								*	**
	ein $dicker_M$ gute Roman							*!	*	*
	ein dicke gute Roman	*!							*	
(104)	DP = [og] ein… dick… gut… Roman	M (Case)	Max-o (A)	Max-og	*M (ein)	Max-o	Max-g	Par-allel	Left-most M	*M
→	$einem_M$ dicken guten Roman				*					*
	$einem_M$ $dickem_M$ guten Roman				*			*!		**
	$einem_M$ $dickem_M$ $gutem_M$ Roman				*					**!*
	ein $dickem_M$ $gutem_M$ Roman		*!	*		*	*		*	**
	ein $dickem_M$ guten Roman		*!	*		*	*	*	*	*
	ein dicken guten Roman	*!	*	*		*	*		*	
(105)	DP = [ ] (sondern) [NP mein…]	M (Case)	Max-o (A)	Max-og	*M (ein)	Max-o	Max-g	Par-allel	Left-most M	*M
	mein	*!							*	
→	$meiner_M$				*				*	*

Notes:

1. If the lexeme *ein* ('one') is not used as a determiner, the constraint (96) does not apply. See the following examples, where *ein* (with the meaning of a cardinal number) occupies a position below the DP shell:

(106) a. [DP Des Piraten [NP *eines* Auge]] blinzelte.
('The pirate's one eye twinkled.')
b. [DP Sein [NP *eines* Auge]] blinzelte.
('His one eye twinkled.')

Consider also the weak inflection of *ein* in (107). This behavior can be derived from (66) and (67), if *ein* occupies a Spec position within the NP. It is then used like an attributive adjective:

(107) a. das *eine* Auge des Piraten
('the one eye of the pirate')
b. mit seinem *einen* Auge
('with his one eye')

2. I suppose that rare alternations as the ones in (108) are due to lexeme splitting:

(108) a. manch-er$_M$ gute Roman
b. manch gut-er$_M$ Roman
(Both: 'many a good novel')

In (108 a) we see a normal adjectivally inflected determiner (= *manch*$_1$), whereas (108 b) shows a homonymous determiner (= *manch*$_2$) that is unable to occupy a position at the end of a main percolation line (and is therefore not inflected).

3. The analysis presented so far has a gap: Not only do the constraints (correctly) prevent the prenominal forms – **einer* [ ], **eins* [n] und **eins* [ng] –, they also incorrectly prevent the masculine accusative *keinen* [g]:

(109) a. Er liest * [$_{DP}$ ein [$_{NP}$ guten Roman]].
b. Er liest [$_{DP}$ ein-en [$_{NP}$ guten Roman]].
(Both: 'He is reading a good novel.')

Technically, the problem can be solved by introducing a special rule of the kind proposed by Müller (2002). The following constraint is equivalent to Müller's GMCOR (Governed Masculine Correspondence):

(110) SPREAD-g = If a DP contains a head with the feature g = [+ governed], all heads of the categories D, A and N bear the feature g.

SPREAD-g is ranked between *2 and M (D, *ein*) and triggers wide-range percolation of [g] in the DP. Its effect, however, is limited by its position in the constraint hierarchy. As a result, SPREAD-g is only crucial for masculine singular (in the case of attributive adjectives and several determiners it applies redundantly). Note that SPREAD-g is not applicable to DPs with feminine, neuter or plural nouns, since the constraint hierarchy prevents any head with the feature bundles [fg], [ng] and [fng]; see sections 3 to 0.

7.4. Special Case II: Absence of Parallel Inflection in the Dative Singular

So far, I have not once mentioned interactions between phonology and morphosyntax. The example below shows that at least some of the interactions can be explained without cooccurrence constraints referring to phonological as well as morphosyntactical categories.

In contexts where we would expect the suffix of the strong inflection *-em,* we often encounter *-en.* I assume the following phonological markedness constraint:

(111) *SCHWA-m = German word forms do not end in schwa + /m/

Prescriptive grammars label the replacement of *-em* by *-en* as "out-of-date". On the assumption that they are right, we can make out two variants of EVAL in German: A traditional EVAL$_{Trad}$ and a progressive EVAL$_{Pro}$. In EVAL$_{Trad}$ PARALLEL is ranked higher than *SCHWA-m, whereas in EVAL$_{Pro}$ we find the inverse ranking. In a intermediate state EVAL$_{Inter}$, the constraints in question are conjoined.

The respective Tableaux (*aus hartem rotem Gestein* = 'of hard red rock'):

$\text{EVAL}_{\text{Trad}}$

(112)	DP = [og] (aus) hart… rot… (Gestein)	M (CASE)	MAX-o (A)	MAX-og	SCHWA -m	PAR-ALLEL	LEFT-MOST M	*M
	(aus) $\text{harte}\text{m}_{\text{M}}$ $\text{rote}\text{m}_{\text{M}}$ (Gestein)				**!			**
→	(aus) $\text{harte}\text{m}_{\text{M}}$ roten (Gestein)				*	*		*
	(aus) harten $\text{rote}\text{m}_{\text{M}}$ (Gestein)				*	*	*	*
	(aus) harten roten (Gestein)	*!					*	

$\text{EVAL}_{\text{Inter}}$

(113)	DP = [og] (aus) hart… rot… (Gestein)	M (CASE)	MAX-o (A)	MAX-og	SCHWA -m	PAR-ALLEL	LEFT-MOST M	*M
→	(aus) $\text{harte}\text{m}_{\text{M}}$ $\text{rote}\text{m}_{\text{M}}$ (Gestein)				**			**
→	(aus) $\text{harte}\text{m}_{\text{M}}$ roten (Gestein)				*	*		*
	(aus) harten $\text{rote}\text{m}_{\text{M}}$ (Gestein)				*	*	*!	*
	(aus) harten roten (Gestein)	*!					*	

EVAL_{Pro}

(114)	DP = [og] (aus) hart… rot… (Gestein)	M (CASE)	MAX-o (A)	MAX-og	PAR-ALLEL	SCHWA -m	LEFT-MOST M	*M
→	(aus) $\text{harte}\text{m}_{\text{M}}$ $\text{rote}\text{m}_{\text{M}}$ (Gestein)					**		**
	(aus) $\text{harte}\text{m}_{\text{M}}$ roten (Gestein)				*!	*		*
	(aus) harten $\text{rote}\text{m}_{\text{M}}$ (Gestein)				*!	*	*	*
	(aus) harten roten (Gestein)	*!					*	

8. Summary and outlook

In the previous sections I have demonstrated the interaction of cooccurrence constraints and percolation constraints. In sum, the following general picture crystallizes:

(115) Feature Sharing in DPs:

M(CASE) » MAX-fn(w/n) » *2(weak) » MAX-fnog » *o/g(N_{M}) » *3, » MAX-o(A) » MAX-f » MAX-og » *2 » SPREAD-g » *M (D, *ein*) » MAX-o » MAX-n » MAX-g » PARALLEL » SCHWA-m » Leftmost M » *M

In this overall ranking, the following partial rankings are included:

(116) Main percolation line for Case:

M(CASE) » PARALLEL » LEFTMOST M » *M

(117) General ranking of faithfulness constraints for gender/number and case:

MAX-fnog » MAX-o(A) » MAX-f » MAX-og » MAX-n » MAX-g

(118) Morphosyntactic features of Determiners:

MAX-fnog » *3 » MAX-o(A) » MAX-f » MAX-og » *2 » SPREAD-g » *M (D, *ein*) » MAX-n » MAX-g

(119) Morphosyntactic features of strongly inflected adjectives:

MAX-fnog » *3 » MAX-o(A) » MAX-f » MAX-og » *2 » MAX-n » MAX-g » SCHWA-m

(120) Morphosyntactic features of weakly inflected adjectives:

MAX-fn(w/n) » *2(weak) » MAX-o(A) » MAX-f » MAX-n » MAX-g

(121) Morphosyntactic features of nouns:

MAX-fn(w/n) » MAX-fnog » *o/g(N_M) » *3 » MAX-f » MAX-og » *2 » MAX-o » MAX-n » MAX-g

In my opinion, the percolation constraints and the quantificational markedness constraints (quantificational cooccurrence constraints) are the most interesting results. It seems to be worthwhile to search for similar phenomena in other parts of the grammar.

The system developed so far is not yet complete. There is at least one additional type of constraints determining the morphosyntax of DPs, namely visibility constraints. They concern phrases as a whole (maximal projections) and are responsible for phenomena such as the genitive rule as proposed in Gallmann (1990, 1996 a). A pecularity of some of these constraints seems to be that they are blind to the lexical and morphological properties of the input. In certain cases, this may lead to absolute ungrammaticality (ineffability), see (89) and (90) above. For reasons of space, the visibility constraints cannot be discussed in the present paper. But see the manuscripts “Genitivregel” and “Dativobjekte”, written in German, which can be downloaded from the homepage of the author.

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