Distributed Optimality

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Abstract

In this thesis I propose a synthesis (Distributed Optimality, DO) between Optimality Theory (OT, Prince and Smolensky, 1993) and a morphological framework in a genuine derivational tradition, namely Distributed Morphology (DM) as developed by Halle and Marantz (1993). By carrying over the apparatus of OT to DM, phenomena which are captured in DM by language-specific rules or features of lexical entries, are given a more principled account in the terms of ranked universal constraints. On the other hand, also the DM part makes two contributions, namely strong locality and impoverishment. The first gives rise to a simple formal interpretation of DO, while the latter is shown to be indispensable in any theoretically satisfying account of agreement morphology. The empirical basis of the work is given by the complex agreement morphology of genetically different languages. Theoretical focus is mainly on two areas: First, so-called direction marking which is shown to be preferably treated in terms of constraints on feature realization. Second, the effects of precedence constraints

which are claimed to regulate the status of agreement affixes as prefixes or suffixes and their respective order. A universal typology for the order of agreement categories by means of OT-constraints is proposed.

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Since the writing of this thesis I have extended and revised substantial parts of the theory and the analyses: Trommer (2002b) develops an extended model of the architecture of the grammar. Trommer (2003a) fleshes out the account of affix order in chapter 7. Trommer (2002a) and Trommer (2003b) revise substantially the account of feature hierarchy effects in chapters 3 and 8.

Tecum principium in die virtutis tuae
in splendoribus sanctorum:
ex utero ante luciferum genui te.

Contents

Chapter 1

Introduction

What is systematic about affix order in the following data from Georgian?[1]

(1)	*v-xedav*	*v-xedav-t*	*xedav-s*	*xedav-en*
	S1-see	S1-see-PL	see-S3s	see-S3p
	'I see'	'we see'	'he sees'	'they see'

Distributed Morphology, like most current accounts of inflectional morphology, would state for each affix if it is a prefix (*v-*) or a suffix (*-t*, *-d*, *-en*). This is unsatisfying even under a purely descriptive perspective. A more parsimonious account would state that subject agreement af-

[1]See appendix C for the full present paradigm of *xedav* and source references. The conventions for the citation of language data that I adopt in this thesis are laid out in section 1.5.

fixes in Georgian are generally suffixes with the exception of *v* which is a prefix. This interaction of a general rule and an exception statement can be naturally formalized by *ranked violable constraints* as in (2), where (2b) can only apply if (2a) does not

(2) a. *v* is a prefix
    b. All affixes are suffixes

These constraints are *ranked* because the higher ranked constraint (2a) has to be obeyed in case of conflict, and *violable* since (2b) is then violated. Crucially, it is difficult to see how an equally concise characterization of the position facts could be achieved in terms of a derivational account or unviolable constraints. But we can still do better and ask if there is a deeper reason why *v-* is a prefix but not *-t* or *-en*. Indeed, looking at the languages of the world one finds a general tendency for number agreement to be marked on the right and for person agreement to be marked on the left edge of the word (see chapter 6). Thus (2) can be replaced by (3):

(3) a. Number agreement should be maximally rightwards
    b. Person agreement should be maximally leftwards

This clearly predicts the order in *v-xedav-t*, because *v-* marks only person (1st) and *-t* only number (plural), but what about *-en* and *-s*? Since these mark person *and* number, both constraints are relevant. Again, since (3a) is ranked higher than (3b) they are rightwards. Note that we have now completely reversed our original viewpoint: The position of *v-*, which at first seemed to be an idiosyncratic fact about a single affix, now appears as a phenomenon familiar from the literature on Optimality Theory (OT, Prince and Smolensky, 1993) , namely *Emergence of the Unmarked* (McCarthy and Prince, 1994): Universal wellformedness-constraints (in this case (3b)) become visible in a language only under restricted circumstances (the unique featural content of *v-* as pure person marker), blocked otherwise by higher-ranked constraints (here (3a)).

Thus, for the Georgian data, crucial mechanisms of DM can be replaced profitably by the interaction of violable constraints as in OT. The central goal of this thesis is to show that the same is true for many other areas of inflectional morphology, and to develop a framework which combines the basic assumptions of DM with the formal apparatus of OT. The next sections of this chapter are intended to give an idea of the arguments, developed in detail in the following chapters. 1.1 introduces some more arguments for OT in Inflectional Morphology, while 1.2 gives some evidence for postsyntactic morphology, which is a crucial tenet of DM. In 1.3, it is shown that morphological constraints have to be modeled closely corresponding to DM rules. 1.4 provides an overview of the thesis, and 1.5 contains some remarks on my citation practice for language data in this thesis.

1.1 Optimality in Inflectional Morphology

Following the logic of OT, constraints, while themselves universal, can be ranked differently in different languages. Thus we would also expect a language where pure number and pure person markers are positioned as in Georgian but where mixed markers are prefixes. This is indeed the standard case in the prefix conjugation of Semitic languages such as Amharic (Leslau, 1995:301):

(4)	*yə-säbr*	*yə-säbr-u*	*ə-säber*	*ənnə-säber*
	S3-break	S3-break-SPl	S1-break	S1p-break
	'he breaks'	'they break'	'I break'	'we break'

While pure number marking (-*u*, plural) is suffixal, the 1pl affix *ənnə*-, which fuses person and number, appears as a prefix, as does pure person marking (*yə*-, 3rd person).

Finally, the account in terms of violable constraints gives us an idea why subject agreement is often split in the way of Georgian. Marking of person and number in one affix under the proposed constraints inevitably leads to constraint violation, because a rightward position is suboptimal w.r.t the person features and the same holds for a leftward position w.r.t. number. However, with separate marking, both number and person can be expressed in their respective optimal position.

Apart from linearization, other parts of DM also benefit from an OT perspective: *First*, we can model cases, where the same constraint is satisfied by different means in different languages. This is the case for the blocking of certain clitic sequences in Romance by an anti-homophony constraint, which is resolved by substitution in Italian (**si si* $\rightarrow$ *ci si*) and by deletion of one clitic in Spanish (**se se* $\rightarrow$ *se; see* Gerlach, 1998; Grimshaw, 1997).

Second, we find the same constraint valid to various degrees in different languages. Thus Noyer (1992) assumes that there is a universal filter neutralizing number features in verbs that agree with two non-third person arguments. While such a filter can be seen to be at work in many languages, it is suppressed in different contexts (1pl:2 stands for 1pl subject 2nd person object, ✝ for neutralization, ✌ for realization of plural):

(5)

	Nunggubuyu	N. Tiwa	S. Tiwa	A. Tiwa	R.G. Tiwa
1pl:2	†	†	†	†	✌
1:2pl	✌	✌	✌	†	†
2pl:1	✌	†	†	†	†
2:1pl	†	†	✌	†	†

This state of affairs forces Noyer to weaken the constraint into a family of sub-filters. This however is unnecessary in DO, where the filter can be maintained in its most general form, while it can be violated by the effect of higher ranked parsing constraints demanding the realization of plural features. Thus, while in Arizona Tiwa the filter dominates all relevant parsing constraints, in Nunggubuyu PARSE [+2 +pl] is ranked higher and PARSE [+Acc +pl] is ranked higher in Southern Tiwa. Finally, OT gives us a natural means to account for the fact that inflectional morphology is resource-based in the sense that no arbitrarily redundant marking of inflectional categories is possible. This claim of course depends on the nature of the constraints assumed, which are basically of three types:

(6) a. **PARSE Constraints** that require realization of morphosyntactic features by affixes

b. **Impoverishment and Blocking Constraints** that prohibit the realization of features

c. **Alignment Constraints** that demand affixes with certain features align to the right or left edge of the domain

Constraints of the first type favor realization of features but not redundancy. Thus for any conceivable PARSE constraints all candidates in (7) are equally well-formed.

(7) *xedav-en, xedav-en-en, xedav-en-en-en,* ...

A typical blocking or impoverishment constraint could prohibit multiple agreement suffixes and actually block all multiple instances of *-en*. Moreover, multiple realization will always displace features from edges. If all morphosyntactic features are subject to some edge-oriented alignment constraint, this leads to additional constraint violations. Thus, in (7), assuming the already discussed constraints that person features have to be maximally to the left and number features maximally to the right, each additional repetition of *-en* causes additional constraint violations, depicted as "*" in (8):[2]

[2]See chapter 3 for the notation of constraints and violations.

(8)

	NUM ➪ R	L ⇦ PER
xedav-en		*
xedav-en-en	*	**
xedav-en-en-en	**	***
xedav-en-en-en-en	***	****

Since PARSE constraints never requires more than the simple realization of features, and all other constraint types serve to minimize realization of features, redundancy is blocked without any additional stipulation[3].

1.2 Postsyntactic Morphology

So far it looks as if we have a pure OT model, so why should we need anything like postsyntactic morphology? The answer is: While pure agreement morphology induced by wellformedness constraints often does not or only partially reflect syntactic structure, there are clear instances where it does. This is especially clear for other types of inflection such as tense and aspect marking. Let us first take a look at some evidence that we do need a type of underlying abstract phrase

[3]Such as the Non-Redundancy Constraint in Wunderlich and Fabri (1994).

structure. Consider the following data from Swahili (Stump, 1992:217):

(9) a. *ni-wa-penda* 'I like them'
1sg-3pl-like

b. *wa-ni-penda* 'they like me'
3pl-1sg-like

Note first that on the assumption that the features of words are a compositional result of the constituent morphemes (either in its lexicalist vein or in a version of syntactic morphology such as Baker (1985)), we have to stipulate homophonous affixes; otherwise, it remains inexplicable why the meaning of the two words differ. In a post-syntactic theory like Distributed Morphology, we can simply say that there are two different syntactic nodes, namely for (9a) [+1 +sg +Nom][+3 +pl +Acc] and for (9a) [+3 +pl +Nom][+1 +sg +Acc] interpreted by vocabulary items that are under-specified for case. (10) illustrates this for (9a):

(10)

...

[+Nom +1 +sg]	[+Acc +3 +pl]
$\Downarrow$	$\Downarrow$
ni- [+1 +sg]	wa- [+3 +pl]

By the insertion of these items in the underlying abstract structure as in (10), the ordering facts naturally arise. This result will be effectively preserved in DO by the use of correspondence alignment constraints that regulate affix position by reference to the feature content of underlying heads. Note that an enriched lexicalist model like that of Wunderlich and Fabri (1994) can mimic the behavior of vocabulary insertion by relating under-specified affixes to paradigms, but it is not able to account for the ordering asymmetry in (9) since ordering for them is completely determined by surface constraints.

To see that the underlying phrase structure of inflection is that of syntax, let us look at two kinds of evidence. First, allomorphy is determined in certain cases by the syntactic context derived by movement, which I will illustrate with a case from Albanian:

The so-called preposed article (PA), an agreement morpheme which is central to the working of the Albanian DP, is realized as *e* if immediately following the definite article suffix of a 3rd pl fem noun (11a). But it is neutralized to default-*të* (as after an indefinite (11b)) when this adjacency is interrupted by other morphological material, as in (11c), or by movement of the adjective complex to prenominal focus position (11d):

(11) a. *vajz-a-t e shkret-a* ‘the poor girls’
girl-PL-DEF PA poor-PL

b. *vajz-a të shkret-a* ‘poor girls’
girl-PL PA poor-PL

c. *vajz-a-t më të* shkret-a ‘the poorest girls’
girl-PL-DEF more PA poor-PL

d. *të shkret-a-t vajz-a* ‘the poor girls’
PA poor-PL-DEF girl-PL

As shown in Trommer (2000), this effect is due to contextual allomorphy, but the trigger of allomorphy is determined on the basis of the syntactic context, unavailable in lexicalist approaches to morphology.

A more general point is that the order of crosslinguistically attested affixes seems to support a postsyntactic model. What we find for agreement affixes – according to the constraints from (3) – in the languages of the world is (12):

(12)

	both prefixes	Mixed	both suffixes
P > N	Per Num V	Per V Num	V Per Num
N > P	*Num Per V	*Num V Per	*V Num Per

Here, one affix type always precedes the other (Per(son) > Num(ber)). On the other hand, content-containing categories such as tense and aspect are ordered along different principles, as shown by Julien (2000). The order of Tense and Aspect after the stem (Asp > Tns) "mirrors" the order found if both affixes are prefixes (Tns > Asp):

(13)

	both prefixes	Mixed	both suffixes
T > A	Tns Asp Verb	Tns Verb Asp	*Verb Tns Asp
A > T	*Asp Tns Verb	*Asp Verb Tns	Verb Asp Tns

As Julien points out, the distribution of non-agreement categories results if we assume the fixed universal phrase structure [T [A V]] and that movement is always leftwards (Kayne, 1994). The order of agreement and other inflectional categories hence seems to be due to different principles. Taking into consideration that tense and agreement morphology are often sensitive to each other in their allomorphy (14a), and that agreement typically appears outside of tense morphology (14a) or fused with it (14b), the natural locus of agreement morphology is after syntax:[4]

[4]Note that the stem of *xedav* is extended in the imperfect to *xedavd*. *d* could also be analyzed as part of the impf affixes which would not affect the argument.

(14)

a.	*v-xedavd-**i**-t*	*xedavd-**n**-en*	Allomorphy of Impf (-*i*, -*n*)
	S1-see-IMPF-PL	see-IMPF-S3p	triggered by Agr (-*t*, -*en*)
	'we saw'	'they saw'	Agr outside of Impf
b.	*xedav-s*	*xedavd-**a***	Agr and Impf fused (-*a*)
	see-S3s	see-IMPF:S3s	
	'he sees'	'he saw'	

1.3 Distributed Morphology and the Dual Nature of Constraints

In the first section of this chapter, it may look as if we have simply replaced DM by OT, and in the second as if we simply put OT after syntax; but what is the genuine DM part in DO? Note that there is a certain tension between DM and OT-style morphology. In DM, linearity and neutralization work by rules, i.e. through input-output relations. The ideal picture of OT is that of the interaction between faithfulness constraints and markedness constraints applying on the surface, i.e. constraints are exclusively output-oriented. I will argue in this thesis that both positions are too weak. We need output constraints *and* input-output-constraints both for neutralization and for linearization

In the last section, we saw that linearization cannot be derived by exclusive reference to outputs, i.e. the intrinsic contexts of affixes. Nor can it be derived by merely referring to the feature content of underlying nodes. To see this, let us return to our initial example from Georgian, where we accounted for the asymmetry of *v-* as a prefix vs. *-s* as a suffix by the assumption that *v-* is unspecified for number; this can seen by the fact that it is also used in the 1pl form *v-xedav-t*, while *-s* is specified for number, namely sg. Underlyingly of course both, the 1sg as well as the 3sg heads are singular. Thus, applying the supposed constraints w.r.t. underlying features, *-s* and *v-* should appear in the same positions..

The same is true in neutralization. There are facts that are very naturally accounted for by a surface constraint like the cited prohibition of multiple *se/si* in Romance or the filter on multiple agreement suffixes in Georgian to be discussed in section 2.2.5. But there are other cases where neutralization must be accounted for in terms of an input-output-constraint in the way of DM's impoverishment. For example, in Menominee (Bloomfield, 1962), the [-3] marker *-m* which marks the presence of 1st or 2nd person arguments is suppressed in the 1sg → 2sg forms of the unnegated independent paradigm:

(15) a. *ke-na·tom-enenϵ***-m-enaw**
2-call-D-[-3]-1pl
'we call you (sg./pl.)' (p. 157)

b. *ke-na·tom-enenϵ (kena·tomen)*
2-call-D
'I call you (sg.)' (p. 157)

This cannot be the effect of a surface filter since the context *-m* would have in (15b) contains a subset of the affixes present in (15a); thus, everything that is blocked in (15a) should also be blocked in (15b). Impoverishment in DO of course cannot be the effect of derivational deletion: It is a kind of anti-parsing constraint which forbids realization of features, and thus preserves the basic idea of impoverishment from DM.

1.4 Overview of the Thesis

Chapter 2: Models of Inflection compares different approaches to inflectional morphology. It is shown that the postsyntactic account advocated in DM has several advantages over lexicalism as well as over "amorphous" accounts. Taking this for granted, I argue that many morphological phenomena receive a more principled account if the postsyntactic morphology module is conceived of as consisting of ranked violable constraints as in Optimality Theory.

Chapter 3: Distributed Optimality introduces the basic framework of Optimality Theory and its implementation in Distributed Optimality. The elementary entities of the theory, especially the constraint types, are introduced and motivated. It is shown how the approach allows us to derive basic facts of inflectional morphology such as the Elsewhere Principle.

Chapter 4: Controversial Issues in OT Morphology discusses specific traits of DO that set it apart from other approaches to OT-morphology: local constraint evaluation, the ban on feature insertion in spell-out, late insertion and the implementation of all constraint types in output and input/output versions. It is demonstrated that the formally relatively restrictive framework advocated in DO can be maintained despite apparent counter-evidence.

Chapter 5: Theories of Affix Order compares different approaches to affix order. I show that standard DM cannot capture certain cross-linguistic generalizations about affix order. The same is also true for lexicalist and affixless approaches. While antisymmetric accounts do much better, as far contentful affixes such as tense and aspect are concerned, they are argued to be unable to account for the order of agreement affixes.

Chapter 6: Subject Agreement: A Distributed Typology of Affix Order develops an account of affix order for subject agreement affixes, based on alignment constraints. Crosslinguistic empirical results on affix order from a small language sample are presented, and it is shown how the distribution of these affixes can be derived by the interaction of the proposed constraints.

Chapter 7: A Minimalist Account of Agreement in Direction-Marking Languages gives a DO account of direction marking which is often claimed to directly encode feature hierarchies. It is argued that all the relevant phenomena can be conspicuously formalized without directly resorting to feature hierarchies. The effect of these hierarchies instead results from the interaction of minimal affix representations with independently motivated PARSE constraints reflecting asymmetries between features.

1.5 Remarks on the Citation of Language Data

Normally, no source is given for simple word forms from languages in which I have some fluency (German, Italian, Albanian, Hungarian). The data from Georgian are summarized in the tables of appendix C with reference to the source grammar and are also used without further reference in the text. For the often cited languages, the source grammar is usually not cited in the text, but only page numbers are given. These refer to my primary source for the respective language which can be found in appendix E. Glosses are my own for the languages which are discussed in some detail (Georgian, Menominee, Dumi, Turkana, etc.), and otherwise taken or reconstructed from the source grammars. Where this seems to be more transparent, feature structures such as [+1+pl] are used in the glosses. In Menominee, which shows rather dramatic phonological sandhi, the segmentation of examples refers to the underlying phonological shapes of morphemes, according to the phonological rules given by Bloomfield (1962). The phonological form of the complete word forms, if different from the underlying representation, is given in parentheses. For all other languages, the segmentation refers to the surface allomorphs.

Chapter 2

Models of Inflection

The goal of this chapter is to discuss some central problems which standard accounts of inflection face and to show in which respects DO improves on them. The focus will be on neutralization, allomorphy and – peripherally – affix order, which will be treated in more detail in chapters 5 and 6. I will start in section 2.1 with a discussion of non-hybrid accounts, based on the idea of a unitary morphology module. Here I come to the conclusion that hybrid accounts, implying the interaction of different morphological modules, fare much better in giving a principled account of the facts. In section 2.2 I introduce two current hybrid accounts, Minimalist Morphology (MM) and different versions of Distributed Morphology (DM). Based on cases where allomorphy interacts with movement, I will argue that Distributed Morphology is correct (contra MM) in positing the morphological component after syntax. Finally, I show that the effects, attributed in standard DM to derivational rules or to unviolable surface filters, are better treated in terms of ranked violable constraints.

2.1 Non-Hybrid Accounts of Inflection

2.1.1 Naive Lexicalism

The most simple idea of inflection goes like this: Morphology is placed in the lexicon, and the combination of morphemes (including affixes) is fully determined by their lexical specifications. Thus, items marked as prefixes and subcategorizing for a verb stem will appear before a verb stem, and the content of the word form, resulting from concatenating these morphemes, corresponds more or less to the set union of the morpheme meanings. (1) illustrates this for the Swahili 1sg verb form *a-penda*, 'I love':

(1) *a-* [+1 +sg +Nom], *penda* [+V +love] ⇒
a-penda [+V +love +1 +sg +Nom]

Plenty of evidence against this simple model can be found in any good textbook on morphology[1], and only the most relevant points will be mentioned here.

Shallow Underspecification

First, affixes are often underspecified w.r.t. their meaning. Underspecification of this type will be called "Shallow Underspecification" in the following. Thus, Swahili *ni-* and *wa-* can mark both subject and object agreement (Stump, 1992:217): [2]

(2)	a.	*ni-wa-penda* 1sg-3pl-like	'I like them'
	b.	*wa-ni-penda* 3pl-1sg-like	'they like me'

There is only one way to cope with this under lexicalist assumptions: To assume that there are two *ni*'s and two *wa*'s specified for Nom and Acc, respectively. Clearly, this misses the point that the difference between (2a) and (2b) is not w.r.t. the affixes used but w.r.t their order.[3] A similar problem is zero affixation. Thus, in Georgian the

[1]E.g. Matthews (1974) and Spencer (1991).

[2]The significance of the Swahili data for the evaluation of lexicalist position was first noted in Stump (1992, 1993a). Some discussion of Stump's own proposals can be found in section 5.4.

[3]The introduction of phrase structure rules into lexicalism can remedy the problems with Swahili (see Stump, 1993a), but grammars of this type remain problematic for the underspecification and

person features of the 2sg verb form *xedav* 'you (sg.) see' is not marked on the verb, which means that we cannot derive its content without assuming a zero affix or other additional devices.

Deep Underspecification

Things are even worse with neutralization/underspecification which is not due to the limited affixal resources of a language and which will be called here "Deep Underspecification". Thus, in Georgian, plurality of 2nd person objects is normally expressed by the number suffix *-t* such as in (3b):

(3) a. *g-xedav* 'I see you (sg.)'
O2-see

b. *g-xedav-t* 'I see you (pl.)'
O2-see-PL

However, no cooccurrence of *-t* and the the 3pl suffix *-en* is possible, When *-en* appears, the number contrast of the object is neutralized:

(4) *g-xedav-en* 'they see you (sg./pl.)'
O2-see-S3p

affix order data discussed below. I omit here a discussion of phrase structure approaches because they play only a peripheral role in actual theoretical discussions.

Again, the point is how to explain the fact that *g-xedav-en* can imply a 2pl object while no affix is present that can express exactly this meaning.[4] Still harder is the problem of how the blocking of *-t* can be achieved except by stipulating that *-en* subcategorizes for a form that is not marked as object 2pl, and that *-t* cannot combine with one that is 3rd subject and 2nd object. This requires effectively negated selection specifications, marking the same effect twice.

Affix Order

Finally, in a lexicalist model no generalizations about affix order can be expressed because the linear position of morphemes depends only on the stipulated features of lexicon entries for the affixes. Thus in Swahili, all agreement affixes are prefixes, but in effect this information has to be repeated for each single affix. This point is especially true for affix order that is determined by syntactic principles (see section 5.4). Since word formation happens in the lexicon independently from syntax, no account of this is possible.

[4] Jensen and Stong-Jensen (1984) give an lexicalist account of Georgian transitive inflection which however uses both additional devices and multiple lexical entries for *-t*.

2.1.2 Naive Syntactic Morphology

The natural antithesis to lexicalism is the claim that inflectional morphology is simply syntax, i.e. word forms are built by syntactic rules and principles along with phrases and sentences. While this thesis has, to my knowledge, never been held without modifications by morphologists, it seems to be implied by work on functional heads in syntax, e.g. Baker (1985, 1988); Pollock (1989); Ouhalla (1991). While syntactic approaches have a principled way of coping with affix order (see Julien, 2000, and the discussion in chapter 5), the problem of neutralization is the same as for naive lexicalism, as long as the atomic units of syntax are held to be fully specified pairs of content and phonological shape. For example, *ni-* in (2-b.) cannot be said to project an Agreement Projection if it is not specified for object features. Especially problematic for this approach are cases where affixes do not match alleged syntactic heads one-to-one. Thus, object agreement in the examples of (3) is expressed by two affixes, while subject agreement is expressed by none.

2.1.3 A-Morphous Morphology

A-Morphous Morphology (AM; Anderson, 1992) has been especially designed to account for cases where the structure of inflected words seems to depart rather arbitrarily from underlying syntactic structures. While stems in AM are classical morphemes, affixes result from the application of procedural word formation rules (WFRs) that interpret morphosyntactic features, supplied by syntactic processes. The Georgian 3pl → 2pl form in (4) might now be represented as (5):

(5) xedav $\begin{bmatrix} case & Nom \\ per & 3 \\ num & pl \end{bmatrix} \begin{bmatrix} case & Acc \\ per & 2 \\ num & pl \end{bmatrix}$

This is spelled out by the rules in (6):[5]

(6) a. $\begin{bmatrix} case & Nom \\ per & 3 \\ num & pl \end{bmatrix} \rightarrow /X + en/$

b. $\begin{bmatrix} num & pl \end{bmatrix} \rightarrow /X + t/$

[5] X stands for the phonological string to which the suffixing operation applies. I have somewhat simplified the notation Anderson uses. Apart from the morphosyntactic features, he would write for (6-a) /X/ → /X+en/. Anderson also distinguishes subject agreement from object agreement by nested feature structures, which I have replaced here by reference to case features to facilitate the comparison with the other accounts presented here.

In AM, WFRs can be organized by stipulation into separate disjunctively ordered rule blocks. where only the first matching rule of each block can be applied. If the rules in (6) are part of such a block, a. blocks b. as required.

The Elsewhere Condition

While Anderson's approach is well equipped to handle the blocking of -*t* by -*en*, other kinds of blocking are problematic, as discussed in detail by McGinnis (1996). Thus, 2pl obj is expressed by *g*- and -*t* (7a). But for a 1pl object -*t* is blocked (7c):

(7) a. *g-xedav-t* 'I see you (pl.)'
O2-see-PL

b. *m-xedav* 'you (sg.) see me'
O1-see

c. *gv-xedav/*gv-xedav-t/*m-xedav-t* 'you (sg.) see us'
O1p-see

Blocking in this case cannot be due to the fact that prefixes and suffixes are in the same rule block, which would also exclude *g-xedav-t*. Intuitively, the reason for this pattern seems to be that *gv*- is a "better" marker for 1pl than *m*- ... -*t*, since it marks plural *and* 1st person in one affix. **gv-xedav-t* is blocked then because double marking of pl is superfluous. Anderson tries to capture such effects by the "Elsewhere Principle":[6]

(8) "Elsewhere Principle: Application of a more specific rule blocks that of a later more general one" (Anderson, 1992:132)

This seems to solve the problem if we assume the rule ordering in (9) :

(9) a. $\begin{bmatrix} case & Acc \\ per & 1 \\ num & pl \end{bmatrix} \rightarrow /gv + X/$

b. $\begin{bmatrix} num & pl \end{bmatrix} \rightarrow /X + t/$

Since the application condition for (9a) subsumes that of (9b), the latter is correctly blocked. Note that this version of the Elsewhere Principle does not refer to the expression of single features to optimize feature realization. Blocking is defined w.r.t. rule application itself, and is in a sense blind for the realization of underlying features. This is a rather subtle point, but in fact it leads to wrong empirical results, predicting incorrectly that (9a) should block (9b) even if *-t*

[6]See section 3.4.4 and Halle and Marantz (1993:162) for further critical discussion of Anderson's use of this principle.

could express the plural feature of subject agreement:

(10) *gv-xedav-t/*gv-xedav* 'you (pl) see us'
O1p-see-PL

Affix Order

A second problem arises with the Swahili data in (2). Anderson (p. 99) allows rules to be underspecified as to whether they refer to object or subject agreement, which seems indispensable for the Swahili facts. The problem is that in an AM grammar all rules are strictly ordered. The only choices we have (apart from multiple rules for *ni-* and *wa-*) are the grammars (11a) and (11b):

(11) a. [1 sg] → /ni+X/, [3 pl] → /wa+X/
b. [3 pl] → /wa+X/, [1 sg] → /ni+X/

Either grammar wrongly predicts that there should be only one possible order for *ni-* and *wa-*.

Affix order is a general problem for AM. As in lexicalist theories, no account for systematicity in affix order is possible, since the order of affixes is partly the result of stipulation inside rules of the form [. . .] → /X+Suffix/ or [. . .] → /Prefix+X/, which accounts for the ordering of affixes w.r.t. stems, and partly of the rule order which accounts for the order of affixes w.r.t each other. A special problem are affixes with different positions in different forms, as in Swahili. This is made even clearer by affixes that can be either suffixal or prefixal in different contexts, such as the class marker *w-* in the Caucasian language Dargwa (Anderson, 1992:98), which agrees as a prefix with objects in transitive forms (12a) and as a suffix with subjects in intransitive ones (12b):[7]

(12) a. ***w***-*āq'a-d* ‘I praise him’
MASC-praise-S1

b. *li-**w**-da* ‘I (masc.) am’
be-MASC-S1s

The defect of AM seems to be that it is *too* amorphous and nothing can be said about affixes as entities in their own right. This also holds true for certain cases of Deep Underspecification: In Menominee, the [+3] person marker *-t* outranks (blocks) the [-3] person marker *-yan* in transitive conjunct verb forms.[8] The same holds for the [+3] marker *-w* and the [-3] marker *-m* in independent forms. The generalization is that only one [+/-3] marker in a form is possible and [+3] wins out in the case of competition. In AM, there is no way to formulate this gen-

[7]Stump (1992, 1993a) tries to resolve such problems, with a richer theory, which will be discussed in detail in 5.4.2.

[8]See section 7.2.4 for details.

eralization. It must be stipulated by ordering the four corresponding rules in one rule block.

2.2 Hybrid Accounts

In AM the morphology module determines how given combinations of morphosyntactic features are interpreted morphologically. In contrast to morpheme-based approaches, where such combinations result from combining stems and affixes, such an approach can be called *realizational*. A common feature of many current approaches to inflection is that they are hybrid in sharing the realizational view with Amorphous Morphology, while retaining a modified concept of the morpheme. In this way, they avoid most shortcomings of non-hybrid accounts. Several hybrid approaches of this type will be discussed, including different versions of Distributed Morphology as developed by Halle and Marantz (1993) and Minimalist Morphology (Wunderlich and Fabri, 1994).

2.2.1 Classical Distributed Morphology

Halle and Marantz (1993) characterize Distributed Morphology by the following features:

- Late Insertion

- Underspecification
- (Syntactic) Structure all the way down

Late Insertion means that the syntactic component manipulates lexical items (LIs) without phonological content, which are spelled out by vocabulary items (VIs) after syntax. VIs are underspecified w.r.t their morphosyntactic features (*Underspecification*). Insertion is crucially driven by the Elsewhere Condition (Kiparsky, 1973), which means that for a given lexical item L the most specific[9] vocabulary item is inserted that is non-distinct from L. The third feature (*Structure all the way down*) points at a property that differentiates DM from other postsyntactic models such as AM. While in AM only single syntactic words are spelled out without any reference to their syntactic context, this context in DM remains accessible for the operation of morphological rules.

More concretely, the overall organization of DM is as follows: At some point in the derivation ("Spell-Out") a copy of the actual syntax tree is made and delivered to the morphological component (Morphological Structure, MS). MS modifies it in several respects, supplies the lexical items with phonological content and thus creates the input for

[9] I.e. which is characterized by the most features or by the most specific context restrictions. See section 3.4.4 for more discussion.

phonology. MS involves the following operations:

1. Semantically non interpretable nodes like AGR heads are inserted.

2. Terminal nodes are further manipulated. Features are deleted ('Impoverishment'), split off into separate nodes or fused, etc.

3. Phonologically specified vocabulary items are inserted into the terminal nodes.

4. Morpho-phonological readjustment rules modify the inserted material.

Points 1 and 4 will only be of peripheral interest here, but I will argue that all processes that belong to 2 and 3 can be modeled more adequately in terms of OT.

As an illustration for the working of DM I give a short analysis of some classical Arabic data, namely a fragment of the jussive verb paradigm (Halle, 1997)[10]:

[10] 1 = 1st person, 2m = 2nd person masculine, 3m = 3nd person masculine. 2nd and 3rd person feminine forms are omitted.

(13)

	Singular	Dual	Plural
1	*ʔ-aktub*	*n-aktub*	*n-aktub*
2m	*t-aktub*	*t-aktub-aa*	*t-aktub-uu*
3m	*y-aktub*	*y-aktub-aa*	*y-aktub-uu*

In terms of Halle & Marantz (1993) these data suggest the following analysis: An agreement node is introduced onto which the features of the subject are copied. An impoverishment rule deletes the distinction between plural and dual in the 1st person, i.e. the value +du (dual). Person and number of the agreement node are fissioned into two separate X^0's. Finally, vocabulary items from the following list are inserted:

(14)

/*ʔ-*/	$\leftrightarrow$	[+1 -3 -pl]
/*n-*/	$\leftrightarrow$	[+1 -3 +pl]
/*t-*/	$\leftrightarrow$	[-1 -3]
/*y-*/	$\leftrightarrow$	[+3]
/*-aa*/	$\leftrightarrow$	[+pl +du]
/*-uu*/	$\leftrightarrow$	[+pl]
/*aktub*/	$\leftrightarrow$	[+aktub]

Note that the *VIs* are underspecified. Only a *VI* that subsumes the relevant node can be inserted. In the case of multiple matching *VIs* the one that comes first in the list is preferred. More specific *VIs*, i.e.

those with more feature specifications, always precede less specified ones. Derivations for the dual forms are schematically depicted in (15):

(15)

	1 Dual	**2 Dual**	**3 Dual**
AGR Insertion	[+1 -3 +pl +du]	[-1 -3 +pl +du]	[-1 +3 +pl +du]
Impove-rishment	[+1 -3 +pl ~~+du~~]	[-1 -3 +pl +du]	[-1 +3 +pl +du]
Fission	[+1 -3 + pl]	[-1 -3] [+pl +du]	[-1 +3] [+pl +du]
Vocabulary Insertion	*n-*	*t-* *-aa*	*y-* *-aa*

It is important to keep in mind that the concrete implementation of standard DM as the successive application of insertion steps following the application of rules like impoverishment, etc. (see below), is just one possible way to meet the requirements of DM listed at the beginning of this section. In fact DO does the same job modeling Vocabulary Insertion by the interaction of ranked violable constraints.

Let us see how DM copes with our Swahili data. We can assume the syntax outputs in (16) and the vocabulary items in (17):

(16) a. penda $\begin{bmatrix} case & Nom \\ per & 3 \\ num & pl \end{bmatrix} \begin{bmatrix} case & Acc \\ per & 1 \\ num & sg \end{bmatrix}$,

b. penda $\begin{bmatrix} case & Nom \\ per & 1 \\ num & sg \end{bmatrix} \begin{bmatrix} case & Acc \\ per & 3 \\ num & pl \end{bmatrix}$

(17) a. /wa-/ $\leftrightarrow \begin{bmatrix} per & 3 \\ num & pl \end{bmatrix}$

b. /ni-/ $\leftrightarrow \begin{bmatrix} per & 1 \\ num & sg \end{bmatrix}$

Spell-out now starts at the stem and proceeds outwards. For each abstract morpheme the VI that fits best is inserted. So we start with $\begin{bmatrix} case & Nom \\ per & 3 \\ num & pl \end{bmatrix}$ in (16a) and insert *wa-* getting *wa-penda* and proceed to $\begin{bmatrix} case & Acc \\ per & 1 \\ num & sg \end{bmatrix}$ where *ni-* fits resulting in *ni-wa-penda*. For (16b) of course the opposite order applies.

Classical DM also has the means to handle Deep Underspecification as in our Georgian case in (4) where *-t* does not surface. Here, we can say that the plural feature of the object agreement node is deleted for the constellation 3pl → 2pl by an impoverishment rule. Consequently, the following insertion of *-t* is impossible. Another possible account is that the nodes for subject and object agreement fuse into a single node. Since only a single VI can be inserted in a given node, and *-en* is more specific than *-t*, the latter cannot be inserted.[11] A third possibility would be that there is simply a zero allomorph for *-t* restricted to the context 3pl subject which has precedence over *-t* since it has a context specification. Thus in a sense, DM's inventory to describe these facts seems not to poor but rather too rich to decide which analysis is most appropriate.

The fact that object agreement is split between a prefix and a suffix in the 2pl but expressed by a single affix in the 1pl (see (7)) is expressed by Halle and Marantz (1993:118) by the fission rule in (18) which splits off a plural feature in certain contexts and thus accounts for the difference. Note that the relevant agreement head is treated as a clitic (Cl) by Halle and Marantz:

[11]This analysis does not make much sense in this case, but Halle and Marantz (1993) use it for Georgian prefixes.

(18) $\begin{array}{c}\text{Cl} \\ | \\ [+\text{pl}]\end{array}$ + Stem → [+pl] +Cl +Stem (linear order irrelevant)

unless the [+pl] is part of a [+1], DAT argument

While Classical DM obviates most objections against earlier approaches to inflection, it faces two major shortcomings:

First, DM gives only a partial account for the systematicity of affix order, since as in lexicalist and early syntactic theories (e.g. Baker, 1985; Ouhalla, 1991) the order of affixes w.r.t stems is fully specified by the entries of vocabulary items, and hence in this respect no generalization can be explicitly expressed.

Second, operations like fusion and fission have a somewhat dubious character. To see this let us return to fissioned plurality in Georgian. The data from (7) are repeated in (19):

(19) a. *g-xedav-t* 'I see you (pl.)'
O2-see-PL

b. *m-xedav* 'you (sg.) see me'
O1-see

c. *gv-xedav/*gv-xedav-t/*m-xedav-t* 'you (sg.) see us'
O1p-see

The fact that **m-xedav-t* is impossible is expressed by Halle and Marantz (1993) through the exception statement (the final line) in (18). As pointed out before, there is a much more natural account for this effect: The Elsewhere Condition should block *m-* and *-t*, since the more specific affix *gv-* is available. However, given the way the Elsewhere Condition is implemented in classical DM, *m-*,*-t* and *gv-* are not alternatives at the point of vocabulary insertion: *m-*,*-t* could only be inserted together if a fission rule like (18) has applied, and *gv-* only if no such fissioning has taken place. But the fission rule itself is not subject to the Elsewhere Condition (in its DM version) and thus "blind" for the alternatives. Thus, while the Elsewhere Condition is intuitively responsible for the distribution of affixes in this case, the assumption made in classical DM that multiple exponence has to be licensed by the stipulation of a fission operation makes it impossible to apply it directly. Put an other way, the information that *gv-* exempts *m-* and *t-* – already following from its feature specification under the Elsewhere Condition – has to be doubled by the exception statement of the fission rule.

However, if we assume that fission, i.e. multiple insertion of affixes into a single head, can apply freely, as I will do in section 2.2.4, fusion of items becomes rather pointless. A fused structure like {[+1 +Nom],[+2 +Acc]} then could be spelled out by *v-g-* (a case of fission) but the only reason to assume fusion was to block exactly this. Thus fusion should also be abandoned, which is also a desirable move on conceptual grounds: Fusion not only introduces a rule type not found elsewhere in grammatical theory, but also a type of representation (different items sharing one position) that is completely particular to one rule type.[12]

2.2.2 Minimalist Morphology

Minimalist Morphology (MM; Wunderlich and Fabri, 1994) is a model of morphology which shares many features with classical DM. Thus it also assumes underspecified vocabulary items which interpret morphosyntactic features. Insertion of these as in DM is guided by a version of the Elsewhere Principle, which is separated in MM into different sub-principles. The main differences seem to be that MM maintains the strong lexicalist hypothesis which claims that all word formation happens in the lexicon and replaces morphological rules by constraints. These restrictions also seem to be at the core of what is meant by *minimalist* since MM in fact contains a great number of mechanisms that are not standard in morphology and make it appear as maximalist in its inventory as classical DM. (20) contains a probably incomplete list

[12]Note that fusion phenomena in phonology are real fusion in the sense that features of two segments merge together into one feature structure, which in DM fusion is not the case. (A. Marantz, p.c.).

of the mechanisms employed in MM:

(20)

- Paradigms (Wunderlich and Fabri, 1994:66 ff.)
- Disjunction of Feature Specifications (Wunderlich and Fabri, 1994:283)
- Feature Hierarchies (Wunderlich and Fabri, 1994:246 ff.)
- Relational Information Coded as Features (see section 7.3.4)
- Feature Cooccurrence Restrictions
  (e.g. (17) in Wunderlich and Fabri, 1994)
- Linking Conventions (cf. fn. 18)
- Constraints
  - Pure Output Constraints
    (e.g. (3) in Lakämper and Wunderlich, 1998)
  - Input-Output Constraints (e.g. (21))
  - Transderivational Output Constraints (e.g. (22))
- Inheritance Networks (Wunderlich and Fabri, 1994:255 ff.)

To cope with the fact that word forms can have feature specifications not marked by any affix, MM introduces the traditional notion of a paradigm. Paradigms are constructed on the basis of the features present in underspecified affixes, paradigm cells are filled by forms freely formed by affixation to stems, where the most specific form compatible with the cell specification wins. For example the affix inventory in Wunderlich's analysis of Georgian (Wunderlich, 1996) contains affixes specified through the features +Subject[13] ,+2 and -pl; hence these features form dimensions of the verb paradigm including a cell for [+Subject +2 -pl], i.e. 2sg. Since no affix is compatible with this information, the optimal candidate for an intransitive 2sg form will be the bare stem.

Formally, paradigms in the MM sense seem to involve a notion of abstract morpheme as in DM. The reason for this is that a feature like +2 cannot be simply identified with a paradigm dimension in a language with subject and object agreement where the realization of second person subject and second person object must often be kept distinct. In fact "paradigms" of such languages in MM are often annotated by feature bundles. (e.g. Wunderlich, 1996:281)[14]. Again, this shows the convergence of MM and DM in details of implementation.

[13]This feature is actually coded by Wunderlich through a combination of relational features.

[14]This also leads to problems for the implementation of MM in Fabri et al. (1995).

The role of impoverishment rules is taken over in MM by constraints on the realization of features. Thus the fact that in Georgian only one object can be marked even in ditransitives is accounted for in Wunderlich (1996:280) by the following constraint:

(21) **Object Constraint:** Only one object can be marked.

Constraints of this type are often stated rather intuitively. Thus Wunderlich (1996:ibd.) states that the Georgian 1st person prefix *v-* can not surface in 1sg:2 forms, because

(22) "the combination *g-v-* would not be distinguishable from the already existing single prefix *gv-*"[15,16]

However, the use of constraints does not fundamentally distinguish MM from DM. Constraints disallowing feature realization are also used in the version of DM developed by Noyer (1992) (cf. section 2.2.6) and are a main component of the theory developed in this thesis.

[15]This explanation is also empirically questionable under Wunderlich's assumptions. Since in MM more specific affixes are attached before less specific ones, *g-* (+Acc +2) should be attached before *v-* (+1) which would give *v-g-xedav*, not *g-v-xedav*.

[16]It is somewhat unclear what the marking relation is that is invoked in the formulation of constraints like (22), since this marking is not an explicit part of the theory.

What seems problematic about MM is its approach to affix order. MM is supposed to incorporate the essence of syntactic approaches to affix order, namely the claim that this reflects a hierarchy of functional categories, by the requirement that order of affixation follows the assumed hierarchy.[17] Ordering restrictions in this system refer to the affixes themselves. As Lakämper and Wunderlich (1998) put it:

(23) " . . . we assume that the position of affixes is fully determined by their individual information under the working of general constraints."(p. 117)

This again leads to problems with our Swahili example, since no surface constraint of the type Subject > Object will derive the correct order if *ni-* and *wa-* are unspecified for case.[18] On the other hand, if there is any surface constraint that fixes the order of these affixes it will – incorrectly – only license one ordering. Like in DM, affixes in MM are idiosyncratically specified for their status as suffixes or prefixes which again excludes a principled account for this type of ordering relation.

[17] See Wunderlich and Fabri (1994) and Lakämper and Wunderlich (1998) for a more OT-like implementation of this idea.

[18] The data also are problematic for Wunderlich's proposed Linking Mechanism, as he proposes (p. 279) that "person affixes that are not marked by a case feature relate their information to the subject role by default".

The more general problem is that MM maintains the claim that morphological words are domains where certain syntactic operations cannot apply, while there are specific morphological operations which are blind to the syntactic context outside of single words. Wunderlich and Fabri (1994:238) express this as follows:

(24) "While syntax allows movement, crossreferencing between constituents and explicit devices which links syntactic items (such as agreement and morphological case) morphology is restricted in all these respects: it does not allow affix movement, cross-referencing or explicit linking devices between items within the word."

Restricting myself to movement, I will argue in the next sections that this claim is empirically wrong. From a crosslinguistic point of view, it leads to problems with affix ordering patterns that can only be derived by movement (see chapter 5).[19]

[19]The same point could also be made for agreement. Cf. Albanian *vajz-a* 'the girl', *djal-i*, 'the boy', where the article suffix (*-a*, *-i*) agrees in gender with the noun stem.

2.2.3 More Problems with Lexicalism: Syntactic Allomorphy

A key role in the claim that morphology and syntax are disjoint domains, is played by the question of how we can decide which morpheme sequence is a (morphological) word.[20] In the following, I will use as an uncontroversial criterion the triggering of (non-phonologically conditioned) allomorphy. A simple example for this kind of allomorphy is the apophony of *au* to *äu* in the 2sg of German *saufen*:

(25) a. *ich s**au**f-e* 'I drink'
I drink-S1s

b. *du s**äu**fst* 'you drink'
you drink-S2s

That this process is not due a regular phonological process is clear from *kaufen* which is phonologically almost identical, but does not show the alternation:

(26) a. *ich k**au**f-e* 'I buy'
I drink-S1s

[20] As pointed out by DiSciullo and Williams (1987), there are a number of different word conceptions which do not necessarily converge (phonological word, syntactic word, etc.). By *morphological word* I mean the maximal unit that is visible to the morphology module of the grammar.

b. *du* ***kau****fst* 'you buy'
you drink-S2s

I will assume that non-phonological allomorphy of this type is triggered by the presence of certain morphemes, in the case of *saufen* by the verb and specific affixes like 2sg. Since – by assumption – triggering of allomorphy only happens inside a morphological word, *säufst* must be such a word. In the following I will use the criterion of allomorphic triggering to identify words in some data from Albanian. I will show that inside so-defined domains there is also movement, invalidating the claim that morphology and syntax are mutually exclusive domains.

Allomorphy and Head Movement: Albanian Object Clitics

To start with, let us reverse the problem. How do we get criteria for identifying movement processes? Let us look at a typical instance of head movement that is clearly not word-internal. In German, infinitival verbs occupy a sentence-final (low) position (27a). The finiteness-feature on the other hand triggers movement of the verb to a higher position (probably C^0) (27b). However, movement is blocked when this position is already lexically filled as in subordinate sentences with the complementizer *daß* (27c):

(27) a. *Sie versucht, heute zu*
she tries today to
*kommen./*Sie versucht, zu kommen heute.*
come
'She tries to come today.'

b. *Sie kommt heute./*Sie heute kommt.*
she comes today
'She comes today.'

c. *daß sie heute kommt./*daß sie kommt heute.*
that she comes today
'that she comes today.'

Crucially, we can identify three properties of head-movement:

(28) a. Movement is triggered by a morphosyntactic feature of the head to move.

b. Movement is obligatory when the "target position" is free.

c. Movement is excluded when the "target position" is occupied.

Taking these criteria as typical for head movement, the following data from Albanian are a straightforward case of such movement. Verbs in Albanian (Kallulli, 1995; Trommer, 1997) show fronting in imperative sentences. Thus *hap* precedes clitics such as *e* in imperative sentences[21] (29b) while it follows them in declaratives (29a):

(29) a. *E hap. *Hap e.* 'You open it.'
it open

b. *Hap -e! *E hap!* 'Open it!'
open it

If the negative particle *mos* occupies the prepronominal position, movement is again blocked:

(30) *Mos e hap!/*Mos hap-e!* 'Do not open it!'
not it open

As for the German case, movement is triggered by an inflectional feature (here, mood: imperative), movement is obligatory if the landing position is free (29a) and impossible when this position is filled, as in (29b).

Thus we have good evidence that pronominal clitics and verbs are separate syntactic units in Albanian. Let us now go on to show that they also form a morphological unit. Indeed, Albanian object clitics show a rich wealth of allomorphy which shows that they form morphological words with the stems to which they attach. There are three

[21] See Trommer (1997) for an account of clitic combinations that can follow imperative verbs in unnegated sentences.

pieces of evidence which can be cited here: *First*, the presence of object clitics influences the stem shape of certain verbs. Thus the stem for the second person pl of the verb *thuaj*, 'tell' is *thuaj* with an object clitic (31b), but *tho* without it (31a):

(31) a. *Th**o**-ni!* 'Tell (pl.)!'
tell-S2p

b. *Th**uaj**-e-ni!* 'Tell (pl.) it !'
tell-it-S2p

From the contrast with the forms of "regular" words (e.g. *mëso-ni*, *mësoj-e-ni*, 'Learn (it)!') it is clear that the vowel change in (31) is conditioned by morphology, not by phonology.

Second, clitics also intervene between stems and other morphemes that trigger allomorphy in the inflected word. For example in the presence of the subjunctive marker *të*, 2sg is realized as *-sh* (32b) instead of the zero allomorph in (32a). This is also the case if the clitic *na* intervenes:[22]

(32) a. *na thua-Ø* 'you (sg.) tell us'
us tell-S2s

[22]Note that "intervention" here does not simply mean "not adjacent in linear order". There is also no bracketing of (32-b) that would render the 2sg affix *structurally* adjacent to *të*.

b. *të* *(na)* *thua-sh* 'may you (sg.) tell (us)'
subj (us) tell-S2s

But if *të* and *thua-sh* form a morphological word, *na* too must be part of this word under any reasonable conception of "wordhood".

Third, the insertion of a hiatus-breaking consonant between verb stem and clitic also indicates that these form a morphological word, since no such insertion happens between independent words. More crucially, the realization of this consonant is not completely determined by phonology but also reflects the morphosyntactic signature of the clitic. While the reflexive/nonactive clitic[23] and the dative 3rd person clitic both have the form *u*, the former triggers *-h* (33a) and the latter *-j-* (33b):

(33) a. *Trego-**h**-u-ni!*
explain-h-NAC-S2p
'Explain yourselves!'

b. *Trego-**j**-u-ni* *(gjendjën)!*
explain-j-them-S2p (the matter)
'Explain them (the matter)!'

[23]Note that the non-active *u* – as the other clitics – appears before the stem under appropriate syntactic conditions.

Allomorphy and Phrasal Movement:
The Albanian Preposed Article

The so-called "preposed article" (PA) is an agreement morpheme central to the working of the Albanian DP. It precedes most adjectives and possessor phrases and is not to be confounded with the article suffix (DEF) which is attached to the head noun of a DP. The PA is realized as *e* if immediately following the definite article suffix -*t* of a fem pl noun (34a), but by the default-*të* after an indefinite noun. When the adjacency between -*t* and the PA is interrupted by other morphological material, as in (34c), or by movement of the adjective complex to prenominal focus position (34d), *të* appears with the definite noun instead of *e*:

(34)	a.	*vajz-a-t*	*e*	*shkret-a*		'the poor girls'
		girl-PL-DEF	PA	poor-PL		
	b.	*vajz-a*	*të*	*shkret-a*		'poor girls'
		girl-PL	PA	poor-PL		
	c.	*vajz-a-t*	*më*	*të*	shkret-a	'the poorest girls'
		girl-PL-DEF	more	PA	poor-PL	
	d.	*të*	*shkret-a-t*	*vajz-a*		'the poor girls'
		PA	poor-PL-DEF	girl-PL		

It is clear that the article suffix in (34a) determines in some way the form of the PA, the question is if the relevant process is agreement or allomorphy. What forces us to treat this as allomorphy is that agreement in general is not sensitive to strict adjacency, whereas allomorphy is. Thus *John* in (35) can be separated by an arbitrary amount of lexical material from the agreeing verb *drinks*:

(35) *John often, often ... drinks*

On the other hand the allomorphy of 1sg agreement as -*j* after Albanian verb stems holds only when no other morpheme intervenes, in which case the default affix -*a* is used instead:

(36) a. *dashuro-**j*** 'I love'
love-S1s

b. *dashuro-v-**a*** 'I loved'
love-AOR-S1s

c. *dashuro-fsh-**a*** 'may I love'
love-OPT-S1s

Furthermore, there *is* agreement between the PA and the noun/article-suffix in other cases. If the noun is masc sg, the PA always has the form *i*, even if it is non-adjacent to the article, as in (37b,c):

(37) a. *djal-i i mirë* 'the good boy'
boy-DEF PA good

b. *djal-i më i mirë* 'the best boy'
boy-DEF more PA good

c. *i mir-i djalë* 'the good boy'
PA good-DEF boy

This is natural if we assume that the noun/article-suffix conditions the form of the PA in two ways: By an allomorphy condition which restricts *e* to the immediate context of certain article suffixes and by agreement, as in (37). Since context restrictions on allomorphy are specific to single vocabulary items, it is plausible that *i* does not have the same restriction as *e*. On the other hand, agreement, as we saw is not blocked by intervening material or movement and accounts for the distribution of *i*.

If this is correct and the article suffix triggers allomorphy in the PA then following our criterion these two items must form a morphological word. As can be seen from (37c) and (34d), the adjective and the PA undergo movement independently from the article suffix. As shown in Dimitrova-Vulchanova and Giusti (1998) and Harrison (1997), this is even phrasal movement of AP since the adjective moves in the pre-noun position with modifying particles (38a) or other coordinated adjectives (38b):

(38) a. *më i mir-i djalë*
more PA good-DEF boy
'the best boy'

b. *hallemadhe-s e faqendritur-ës Shqipëri*
painful-DEF:DAT and gloryful-DEF:DAT Albania
'to painful and gloryful Albania'

Thus, once again the domains of movement and allomorphy overlap, as is expected under postsyntactic morphology but which cannot be captured in a lexicalist model.

2.2.4 Minimalist Distributed Morphology (MDM)

What seems problematic about DM in its standard form is the multiplicity of rule types. In Trommer (1999c), I develop a version of DM which tries to avoid this consequence, reduces almost all operations to Vocabulary Insertion and highlights certain restrictive properties of DM. To see how this works let us start with fission. As argued in Noyer (1992) and Halle (1997), fission can be seen as multiple vocabulary insertion into a single node. Thus into (39b) *g-* (40b) and *t-* (40c) can be inserted, into (39a) *gv-* (40a).

(39) a. $\begin{bmatrix} case & Acc \\ per & 1 \\ num & pl \end{bmatrix}$

b. $\begin{bmatrix} case & Acc \\ per & 2 \\ num & pl \end{bmatrix}$

(40) a. /gv-/ $\leftrightarrow$ $\begin{bmatrix} case & Acc \\ per & 1 \\ num & pl \end{bmatrix}$

b. /g-/ $\leftrightarrow$ $\begin{bmatrix} case & Acc \\ per & 2 \end{bmatrix}$

c. /-t/ $\leftrightarrow$ $\begin{bmatrix} num & pl \end{bmatrix}$

Since insertion in MDM by assumption always deletes features of the insertion nodes no multiple insertion of the same item is possible and especially the insertion of *gv-* blocks insertion of *-t* and other affixes. This account of fission is preferable since the whole rule type of fission is rendered superfluous. Also the strange doubling of information observed in section 2.2.1 is eliminated. Thus, as noted above, in the account of Halle and Marantz (1993), the fact that there is fission in 2pl but not in 1pl is reflected in the exception statement of(18) that fission is not applied for 1pl *and* the vocabulary items themselves. In the minimalist version proposed in Trommer (1999c) everything follows from the VIs.

The conception of insertion coupled with deletion also allows us to dispense with the notion of impoverishment, since a zero affix will automatically have the effect of deleting the features that are neutralized. If fusion is seen as empirically superfluous, virtually all that remains from DM is vocabulary insertion of a restricted type. Operations are all feature-consuming and thus the theory makes strong predictions about the measures of redundancy possible in the morphology of natural languages.

2.2.5 Problems with Derivational DM

While MDM is much more simple than Classical DM it also has DM's problems with affix order. Apart from this, certain generalizations about affix blocking cannot be stated by deletion operations but only by surface constraints, as shown by so-called rule-conspiracies where derivational approaches must assume different rules to satisfy the same output requirement, without being able to capture the common motivation of the processes. Such cases also exist in inflectional morphology and I will briefly discus two of them.

Agreement with only 1 Argument in Dumi

In Dumi (van Driem, 1993) only one argument of a transitive predicate is normally (but see below) marked on the surface. While this is generally the higher-ranked person (according to the hierrchy 1st $\gg$ 2nd $\gg$ 3rd person) as in (41a), there is one exception to this, namely the combination of a 2sg subject and a 3rd person object, where only the object features are parsed (41b).

(41) a. *duːkhust-ɨ*
see-[+1-2+du]
'we (two, excl.) saw you' (p. 107)

b. *a-doːkhos-sti*
D-see-[+3-2+du]
'you (sg.) saw them (two)' (p. 107)

To express this in a purely derivational model of DM we need three different rules:

(42) a. [+Nom +2 +sg] $\rightarrow$ Ø/ [+3 +Acc]

b. [3] $\rightarrow$ Ø/ [-3]

c. $[2] \rightarrow \emptyset / [+1]$

All these rules work together to arrive at forms where the verb agrees with only one argument. But this cannot be expressed in a single rule. Phenomena of this type, where different rules "work together" for the same goal, are called "rule conspiracies" in the phonological literature (Kisseberth, 1970) and are a classical argument against purely derivational grammars. OT-based morphology can capture the problematic facts in an intuitive and simple way: A high-ranked constraint forbids multiple arguments to be realized. Different (lower-ranked) Parsing constraints ensure that the correct suffix survives in each case in a way that is described in detail in chapter 7.

Georgian Suffix Blocking

The same point can be made for Georgian where a slightly different type of blocking occurs. As already mentioned, Georgian verb forms normally bear only one simple agreement suffix, even if two would be justified semantically. Thus for (43c) we would expect that *-s* marks S3s, as it does in (43a), but *-s* in this context is not possible:

(43)	a.	*xedav-s* see-S3s	'he sees'

b. *g-xedav-t* 'I see you (pl.)'
O2-see-PL

c. **g-xedav-s-t/g-xedav-t* 'he sees you (pl.)'
O2-see-S3s-PL

"Simple" here means not a portmanteau affix. Thus the marker *-a* which expresses imperfect and S3s is used in the context of *-t*:

(44) *g-xedavd-a-t* 'she saw you (pl.)'
2-see-IMPF:S3s-PL

A rule like (45) captures the non-appearance of *-s* in (43c):

(45) $[+\text{Nom} +\text{Agr}] \rightarrow \emptyset / \_\_ \; [+\text{pl}]$

This rule even covers the fact that there is no double *-t*, where we would expect it otherwise. For example both 1pl subjects (46b) and 2pl objects (44) normally require a *-t* to express plural, but if both categories are combined, only one *-t* appears (46c):

(46) a. *v-xedav* 'I see'
S1-see

b. *g-xedav-t* 'we see/I see you (pl.)'
S1-see-PL

c. *g-xedav-t/*v-xedav-t-t* 'we see you (pl.)'
S1-see-PL

However there is no way to capture the following suffix deletion by the same rule, since this time *-t* does not cause the "deletion" of another affix but is itself deleted in the context of the 3rd person plural affix *-en*:[24]

(47) *g-xedav-en/*g-xedav-en-t/*g-xedav-t*
O2-see-S3p
'they see you (pl.)'

The impossibility of a single rule to effect both deletion processes can be seen more clearly in the following table.

(48)

Context		**Deleted Affix**	
-t	[+pl]	*-s*	[+3 +sg]
-t	[+pl]	*-t*	[+pl]
-en	[+3 +pl]	*-t*	[+pl]

Clearly, the deleted affixes cannot be characterized in a homogeneous way by a feature specification such as [+3] or [+pl]. This means that

[24]McGinnis (1996:12) assumes a single rule to account for the deletion of *-t* in the context of *-en* or another *-t*, but does not treat the blocking with *-s*, which for her analysis would also necessitate a second rule.

a deletion rule covering all three cases could specify only the feature [+Agr]. The context of such a rule would have to be [+pl] since this is the only feature shared by *-t* and *-en*.[25] This means that (45) is the only plausible candidate for such a rule. The application of (45) would however wrongly predict the deletion of *-t or -en* (or both) when both cooccur. We are thus forced in a rule-based account to state two separate rules for Georgian suffix deletion.

Again in DO the same fact can be formalized as a single constraint blocking multiple simple agreement affixes in suffix position. Of course the ranking of PARSE constraints must ensure that the right affix is chosen in each case , e.g. *-s* instead of *-t*, which is the result of a ranking like:

(49) PARSE PER $\gg$ PARSE NUM

This also predicts that languages should exist where the ranking is reversed and plural is preferred over person. In fact, Vogt (1971:85,86) cites varieties of Georgian where we get *g-xedav-t* instead of *g-xedav-s*. Once again this is not expected in a derivational version of DM.

[25] Of course it could also be completely unspecified. If the rule would be restricted in some way to suffixes this would mean that – contrary to fact – any suffix could be deleted in the context of any other suffix.

2.2.6 Filter and Hierarchy DM

The conclusion to be drawn from section 2.2.5 is that even in DM we need a kind of surface filter.[26] Indeed Noyer (1992) in his groundbreaking dissertation has proposed a version of DM where Impoverishment is achieved by the interaction of (unviolable) surface constraints and universal feature hierarchies which determine the way constraint violations are avoided. In this section, I show that surface constraints (contra Noyer) are best viewed as violable and ranked, thus lending support to an OT version of DM.

To illustrate Noyer's approach let us reconsider the data from classical Arabic (example (13)), presented here again:

(50)

	Singular	Dual	Plural
1	*ʔ-aktub*	*n-aktub*	*n-aktub*
2m	*t-aktub*	*t-aktub-aa*	*t-aktub-uu*
3m	*y-aktub*	*y-aktub-aa*	*y-aktub-uu*

Instead of giving an impoverishment rule, Noyer (p. 48) assumes the filter *[1 dual] which blocks the impossible **n-aktub-aa*. While **aktub-aa* also avoids the constraint violation, Noyer claims that such conflicts

[26] Templates as used in (Halle, 1992; Bonet, 1991) are also a kind of surface filter. In so far as they are unviolable, they face the same objections as the filters of Noyer. Templates are also discussed in the context of affix order in chapter 5.

are resolved according to the following principle (ibid:54):

(51) **Impoverishment**

Given a filter of the form $*[\alpha F\ \beta G]$ delink that feature which is lower on the hierarchy of features.

where the hierarchy of features is universal and contains the rankings in (52):

(52) a. $1 \gg 2 \ldots$

b. Person $\gg$ Number

Noyer's approach is restrictive in many desirable ways which cannot be discussed here. The most obvious consequence of this is that we would not expect an impoverishment in any language that deletes person features in the context of number features. As should be obvious, Noyer's approach shares many features with DO, most notably the use of surface constraints.[27] However there are some basic differences: *First*, surface Constraints for Noyer ("Filters") are unviolable,[28] in DO

[27] In fact Noyer proposes a version of OT-based morphology including his filter concept in Noyer (1993b).

[28] This also holds for Noyer's approach to OT morphology Noyer (1993b) where surface filters are assumed to be underlying filters, which are required to be obeyed on the surface by faithfulness (ibid:4,5) which for Noyer is unviolable.

all constraints are violable. *Secondly*, for Noyer there are no impoverishment constraints. *Finally,* the feature hierarchy allows only one possibility to resolve violations of surface constraints while in DO such conflict resolution depends on (mainly parsing-) constraint ranking in a language-dependent manner. While Noyer's approach is thus more restricted than DO, there are facts showing that these restrictions are empirically untenable.

Feature Hierarchies are Constraint Hierarchies

A central claim of this thesis is that there is no formal equivalent of feature hierarchies. Instead, what is claimed in other theories to follow from these is in DO the effect of rankable constraint hierarchies. This will be demonstrated in a more general way for direction morphology in chapter 7. Here I discuss two cases critical for Noyer's feature hierarchy approach.

As Noyer (1998:271, fn. 5), citing Harris (1994), himself notes there are cases where person is impoverished in favor of number. Namely, in Latin American Spanish (LAS) object clitics "the opposition between 2nd and 3rd person in the plural of every syntactically second person plural item" is neutralized. Recall that Noyer's account of number neutralization in Arabic is crucially based on person being ranked higher in the hierarchy than number. If such a hierarchy exists it must be ordered the other way around in LAS, hence the hierarchy cannot be a universal one. But different ranking is exactly what we expect if the responsible hierarchy contains not features but OT-constraints. What we can say in DO is that a high-ranked filter against expression of person *and* number dominates (53a) in Arabic and (53b) in LAS, leading exactly to the observed asymmetry in neutralization.

(53) a. PARSE PER $\gg$ PARSE NUM
b. PARSE NUM $\gg$ PARSE PER

PARSE constraints of course are independently motivated in DO to account for the general realization of features by affixes.

Another case of neutralization running counter to Noyer's hierarchy is the blocking of [+1] prefixes in the context of a [+2] prefix in Algonquian languages such as Menominee. In (54a,b) *ne-* realizes [+1] and *ke-* [+2]. In the inclusive plural, which is characterized as [+1 +2], both affixes would be expected, but only *ke-* surfaces:

(54) a. ***ne-****po·se-m* 'I embark' (p. 150)
1-embark-[-3]

b. ***ke-****po·se-m* 'thou embarkest' (p. 150)
2-embark-[-3]

c. ***ke-****po·se-q* 'we (incl.) embark' (p. 150)
2-embark-1pl

Under Noyer's approach exactly the opposite result would be expected. He tries to escape this consequence for the same problem in the related language Potawatomi (ibid:169) by claiming that this is not systematic preference for [+2] but the effect of a more specified VI for *ne*- as [+1 -2] as opposed to [+2] for *ke*-. However, this only works for intransitive cases. *ne*- and *ke*- also express person features of transitive objects (55a,b) (and subjects)

(55) a. ***ke-****na·n-eko-w (kena·nek)*
2-fetch-D-[+3]
'he fetches thee' (p. 154)

b. ***ne-****na·n-eko-w (nena·nek)*
1-fetch-D-[+3]
'he fetches me' (p. 154)

Only one prefix is possible and Noyer's theory predicts that *ne*-, which is marked [+1 -2] and more specific than *ke*- [+2], should win. However, contrary to this prediction, [+2] again wins over [+1]:

(56) a. ***ke-****na·tom-enenϵ-m-uaw* 'I call you (pl.)' (p. 157)
2-call-D-[-3]-2pl

b. ***ke-****nϵ·w-e-m* 'you (sg.) see me' (p. 156)
2-call-D-[-3]

Again these facts can be expressed conspicuously by the ranking of PARSE constraints (PARSE [+2] $\gg$ PARSE [+1]) under the pressure of a higher ranked filter allowing only one prefix (see chapter 7 for a full analysis).[29]

One Constraint: Different Resolution Strategies?

One of the basic achievements of OT is that it allows to express the fact that universal constraints are satisfied by different resolution strategies if markedness constraints do not allow the realization of input features. Thus, for a phonological input of the form $C_1V_2C_3$, a candidate which realizes all the segments from the input in a syllable ($[C_1V_2C_3]_\sigma$) will necessarily violate the constraint NoCoda which penalizes coda consonants. GEN offers different possibilities to resolve this conflict by deletion ($[C_1V_2]_\sigma$) or insertion ($[C_1V_2C]_\sigma$) of segments. Which resolution strategy for the conflict is choose is determined by the ranking

[29]Note that even the functional-typological literature, which is the principal source for the idea of feature hierarchies, admits that the ranking 2 $\gg$ 1 exists in languages. Cf. DeLancey (1985); Silverstein (1976).

of constraints such as PARSE (penalizing deletion of segments) and FILL (penalizing insertion).

Contrary to OT, Filter and Hierarchy DM assumes that the same constraint induces basically the same resolution strategy in each case. This has already been shown to be problematic empirically for the specific feature hierarchy Noyer assumes. In this section further cases are discussed where constraints effecting neutralization induce different resolution strategies as expected in an OT-framework.

Noyer (1992:310-19) presents a number of languages which all seem to have basically the same filter. In Nunggubuyu (ibid:277), number for 1st person arguments is neutralized if the other argument is 2nd person. Thus there is a number distinction in (57a,b) but not in (57c):

(57)
a. *ŋa-nu-* 'I:him ...'
1-MASC-

b. *nu:-nu-* 'We:him ...'
1pl-MASC-

c. *ŋa-na-* 'I/We:you (pl.) ...'
1-2pl-

In Northern Tiwa, "the system is even more restrictive ...: when 2 acts on 1 there is but one prefix *may-* which marks number for neither participant" (ibid:312):

(58)

		Object			
		1	2sg	2dual	2pl
Subject	1	*	*ą*	*mą-pęn-*	*mą-pi-*
	2	*may-*	*	*	

Interestingly Noyer does not state an explicit filter for this language.

The filter for the related language Southern Tiwa (*[$_{\text{SUBJ}}$ +part +aug][30] [+part]) "deletes number from the subject but not the object in a clause with two [+participant][31] arguments" (ibid:312) as can be seen from the contrast between bey-and *ku-*:

(59)

		Object				
		1	1pl	2sg	2dual	2pl
Subject	1	*	*	*i-*	*men-*	*ma-*
	2	*bey-*	*ku-*	*	*	*

In another related language, Arizona Tiwa, no number is expressed for any combination of 1 and 2 categories, thus we have the filter *[+part +part +aug].

Finally, in Rio Grande Tiwa number of all 1 → 2 and 2 → 1 combinations is lost, except for the number of 1st person subjects in 1 →

[30][+aug(mented)] specifies plural in Noyer's feature system.

[31][+part(icipant)] is the characteristic feature of "speech act participants", i.e., 1st and 2nd person NPs.

2 combinations. While Noyer again gives no explicit filter, he makes it clear that this language again has a filter which is not found in the other cited languages. Thus we have in effect five different filters whose effect is shown schematically in (60), where ✌ indicates that the corresponding pl feature in the leftmost column is realized and † that it is neutralized.[32]

(60)

	Nunggubuyu	N. Tiwa	S. Tiwa	A. Tiwa	R.G. Tiwa
1pl:2	†	†	†	†	✌
1:2pl	✌	✌	✌	†	†
2pl:1	✌	†	†	†	†
2:1pl	†	†	✌	†	†

This is after all an odd result since Noyer wants to show that "the filter 1-2-number deletion (or a variant thereof) is likely to be a UG filter" (ibid:310) Note that under Noyer's approach we do not in effect have *one* UG filters but *five* variants, clearly an undesirable result for any restrictive model of Universal Grammar. Note that this multiplicity of filters is a necessary result of Noyer's approach where filters are the only variable component of neutralization. As we would expect, this problem disappears in a DO account where we can state the filter in

[32]Interestingly, the number feature of the argument which is not specified for number – e.g. 2 in 2:1pl – is irrelevant for the neutralization process.

a maximal general form and put the burden of variation on different PARSE constraints.

I will hence assume that in all these languages an impoverishment constraint is visible that kills all number marking in the context of [+part] [+part] (i.e. two non-third person arguments). This constraint is crucially undominated in A. Tiwa, which means that in this constellation no number marking is possible. In Nunggubuyu PARSE $[+pl]^{[+2]}$ dominates the Impoverishment constraint retaining number marking for 2pl categories while in S. Tiwa PARSE $[+pl]^{[+Acc]}$ is in the same constellation ensuring plural marking of objects regardless of person features.[33] A combination of these constraints PARSE $[+pl]^{[+1\ +Nom]}$ is dominant in R.G. Tiwa, while all other constraints are dominated by Impoverishment. Finally in N. Tiwa PARSE $[+pl]^{[+2\ +Acc]}$ effects the exception to the general neutralization picture:

[33]PARSE $[+pl]^{[+2]}$ requires that the feature +pl of an underlying [+2] head be realized (parsed). See section 3.3.1 for the details of the notation and interpretation of PARSE constraints.

(61)

Nunggubuyu	PARSE [+pl]$^{[+2]}$	≫ IMPOVERISH ≫ PARSE ...
N. Tiwa	PARSE [+pl]$^{[2\ +Acc]}$	≫ IMPOVERISH ≫ PARSE ...
S. Tiwa	PARSE [+pl]$^{[+Acc]}$	≫ IMPOVERISH ≫ PARSE ...
A. Tiwa		≫ IMPOVERISH ≫ PARSE ...
R.G. Tiwa	PARSE [+pl]$^{[+Nom\ +1]}$	≫ IMPOVERISH ≫ PARSE ...

OT-mechanisms thus allow us to state general principles in a concise way not available in a more rigid system with unviolable filters.

Different resolution strategies for surface filters can also be observed in single languages. Thus in Dumi, as already discussed, normally only one argument of a transitive predicate is marked on the surface. While this is generally the higher-ranked person (according to 1 ≫ 2 ≫ 3), as expected under Noyer's approach, there is one exception to this: In the combination of 2sg subjects and 3rd person objects forms, only the object features are parsed:

(62) a. *du:khust-ɨ*
see-[+1-2+du]
'we (two, excl.) saw you ' (p. 107)

b. *a-do:khos-sti*
D-see-[+3-2+du]
'you (sg.) saw them (two)' (p. 107)

This is effected by the constraint PARSE [+3 +sg] / [+2 +Acc] ranked over PARSE [+1] $\gg$ PARSE [+2] $\gg$ PARSE [+3]. Again, under Noyer's model no modeling of multiple strategies for satisfying the surface filter is possible.

Surface Filters are Violable

Let us finally turn to the claim that surface constraints are inviolable. Note that this claim is not a universal one. Filters can be inactive in specific languages. But in languages where they are clipped on they have to be obeyed without exception. Problems with this view arise if such constraints are generally obeyed in a language but show systematic exceptions. Thus, in Dumi (for more details see 7.2.3) even in transitive verbs only one agreement category is overtly marked by agreement according to the feature hierarchy 1 > 2 > 3 (63a). However, for combinations of a 1sg and a [-1 pl] argument both arguments are marked (63b):

(63) a. *du:khust-ɨ*
see-[+1-2+du]
'we (two, excl.) saw you ' (p. 107)

b. *doːkhot-t-ə-nɨ* 'I see them' (p. 107)
see-NPast-1sg-[-1+pl]

In DO, this can be simply stated by the fact that the surface filter prohibiting the expression of multiple agreement is dominated by a PARSE constraint requiring -1pl to be parsed in the context of a 1sg argument. In Noyer's approach different surface filters would have to be invoked to achieve the same effect without expressing the fact that the suppression of multiple agreement is simply the standard situation in Dumi.

Interestingly, the same PARSE constraint as in Dumi can be observed in the Amerindian language Yurok, where in all forms involving a 3rd plural object (64a), except in the 1sg:3pl form (64b), no object marking takes place, i.e. the forms are identical to the corresponding intransitive forms:

(64) a. *koˀmoy-o-ˀm* 'you hear/you hear them' (p. 70)
hear-S2s

b. *koˀmoyo-ˀs-ek* 'I hear them' (p. 72)
hear-O3s-S1s

Thus what seems universal are not fixed feature hierarchies but specific PARSE constraints, as expected in a theory with ranked, violable constraints.

Chapter 3

Distributed Optimality

In this chapter, the overall architecture of DO and the technical details of its implementation are presented. I start with a short introduction to Optimality Theory in general (3.1), followed by an overview of the basic components of DO (3.2). Section 3.3 introduces the various constraint types that are used and 3.4. shows how basic facts about inflectional morphology such as the Elsewhere Condition can be derived from the architecture of DO. The specific design choices of DO w.r.t. other OT-accounts of morphology are discussed and justified in chapter 4.

3.1 Optimality Theory

Optimality Theory is a constraint-based approach to grammar that was originally proposed as a new model of generative phonology. As in derivational versions of generative phonology such as SPE (The Sound Pattern of English; Chomsky and Halle, 1968), the basic conception of the grammar is that of a device which maps underlying inputs into corresponding output forms:

(1) $\text{Input} \longrightarrow \boxed{\text{Grammar}} \longrightarrow \text{Output}$

OT-constraints, which are the atomic unit of an OT-grammar, can be viewed as functions that assign numbers of violation marks to possible output forms. For example, a constraint that forbids more than one suffix (BLOCK Suffix) can be said to assign two violations to *wait-s-ed-ed*, one to *wait-ed-s* and none to *wait* and *wait-ed*. Constraint violations are most often depicted in tableaus as the following, where the constraints are listed horizontally and possible forms vertically. Constraint violations are depicted by stars:

(2) English Verb Forms in a simple OT-tableau

	BLOCK Suffix
☞ *wait*	
wait-s-ed	*!
☞ *wait-s*	
wait-ed-s-s	*!*
☞ *wait-ed*	

If the members of a candidate set differ w.r.t the violations they induce, the subset of candidates which incur minimal violations are called *optimal.* Optimal candidates are marked by the ☞ icon in tableaus. The exclamation mark after a star shows a "fatal" violation, i.e. one that causes the pertaining form to be suboptimal.

While the constraint in (2) is independent of any input, many constraints in OT refer to the relation between input and output forms. Thus, a constraint that requires that the past tense feature be overtly realized is violated in *wait-s* for an input like [+3 +past] but induces no violation for the input [+1 +pres]. Formally, a constraint is then a function from pairs of strings (an input and an output) onto sets of violation marks.

A second way of viewing constraints, one which derives straightforwardly from the first, is to see them as filters that map inputs and sets of candidates onto subsets which contain all and only those candidates which are optimal w.r.t. the constraint. BLOCK Suffix would accordingly map the set {*wait wait-s-ed, wait-ed-s, wait-ed-s-s, wait-ed* } into the set {*wait wait-ed, wait-s* }.

While SPE rules and OT-constraints differ in that the latter operate on strings *and* string sets, they are alike in being hierarchically ordered in specific grammars:

(3) English Verb Forms with ranked constraints

Input:[+past +3]	BLOCK Suffix	PARSE Past	PARSE Person
wait		*!	*
wait-s-ed	*!		
wait-ed-s	*!		
☞ *wait-ed*			*

Ordering in OT corresponds to successive filtering: {*wait, wait-ed, wait-s* } resulting from the first constraint is reduced to {*wait-ed* } by the second one and mapped to the same set by the third since the candidate in a singleton set is always optimal. The initial candidate set for each candidate is derived by the language independent operation GEN. There are different versions of GEN depending on the overall architecture of the OT-implementation (cf. Prince and Smolensky, 1993;

McCarthy and Prince, 1995), but generally it is assumed to restrict candidate sets only by general conditions on formal wellformedness and above all to generate infinite candidate sets.

Perhaps the most interesting claim of OT is that all constraints are universal. Languages differ from each other only in the relative ranking of constraints. So if we change the ranking of (3), we get the following tableaux, where *wait-d-s* is optimal:

(4) The constraints from (3) re-ranked

Input:[+past +3]	PARSE Past	PARSE Person	BLOCK Suffix
wait	*!	*	
☞ *wait-d-s*			*
wait-s	*!	*	
wait-ed		*!	

This of course is the wrong result for English, but it fits quite closely to the (correct) corresponding German form *wart-et-e*, wait-PAST-S3s, ‘he waited’. We can say then that German morphology differs from English in this fragment not w.r.t. its constraints, but only in its constraint ranking.

3.2 The Structure of DO

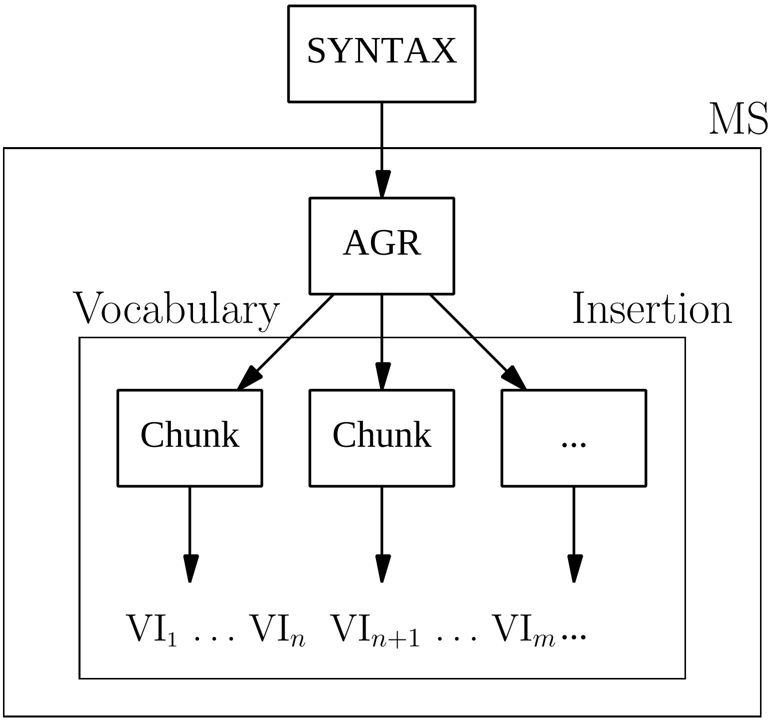
3.2.1 The Overall Architecture

It is an open question for OT-Morphology where the input comes from that is then expressed morphologically. For reasons to be discussed in detail in chapters 4 and 5, I will assume that OT-Morphology interprets the output of syntax at Morphological Structure (MS), as in Classical DM. As discussed in Trommer (1999c), this happens in small chunks corresponding roughly to a lexical head and all adjacent functional heads from its extended projection. These chunks will be called *spell-out domains*[1]. Following Halle and Marantz (1993), MS also involves the insertion of "dissociated morphemes" as agreement heads (depicted in (5) simply as 'AGR'). These processes are relatively close to syntax and will not be discussed in this thesis. Further components of the model in Halle and Marantz (1993) are rules (such as impoverishment and fission) preceding vocabulary insertion and morphophonological readjustment rules following it. The first type is eliminated in DO

[1]Note that spell-out domains are not necessarily X^0-complexes derived by head-adjunction, as in the early syntactic accounts of morphology. See chapter 5 for further discussion. Context specifications of VIs, which are however subject to adjacency conditions, are not necessarily fulfilled inside of these domains. A case where the relevant context for a head is outside of its spell-out domain is the allomorphy of the Preposed Article discussed in (33).

and partially reformulated as part of the OT-constraints determining vocabulary insertion. I suppose that readjustment rules, too, are better expressed in terms of violable constraints, but again this cannot be worked out in this thesis.

(5)



Spell-out domains will be represented as ordered sequences of abstract morphosyntactic head tokens as:

(6) [+stem][+tns +impf][+Nom +1 +pl]

where the ordering corresponds to asymmetric c-command in the sense of Kayne (1994). The list notation may thus be seen as a partial coding of hierarchical constituent structure (see chapters 5 and 6 on the question of linearization). There is a general philosophy in DO that most components can refer to outputs alone or to the relation of input and output. This is true of the context specifications of Vocabulary Items (see section 3.2.3) as well as for constraints (see 3.3 and 4.3).

3.2.2 Formal Preliminaries

Feature Structures

The formal primitives of morphology as conceived here are feature structures, i.e. partial functions from sets of features into values, where features and their values are atomic units. There are good reasons to assume a richer structure for morphological features which allows feature structures as values of other features, or involves a form of feature geometry (cf. Harley, 1994). A feature-geometric model which also involves more features (such as separate features for person and 1,2 etc.) will also be argued for at several points of this thesis. So it should be clear that adopting the simpler model here is due to space limitations and to the complexity of combining such a model with a newly developed OT-framework. I will however simulate properties of a feature-geometric account where it is convenient and assume things like a feature +/-per(son) which would have as a value complex feature structures such as [1 +] in a more adequate formalization. The same holds for a feature such as case which I will sometimes take to have multiple values as in [case Nom] and [case Acc], assuming at other places that Nom and Acc are themselves features as in [Nom +] or [Acc -]. Again, in a tree account Nom and Acc probably would be features dominated by case and hosting on their sides "+"- and "-"-values. Binary feature-value pairs will often be written in the prefix notation, i.e., [+1] is a shorthand notation for [1 +]

Subsumption

A feature structure FS subsumes another feature structure FS' if both are non-distinct and FS is less specific than FS'.
For example, (7a) and (7b) both subsume (7c), but not vice versa. Neither does (7a) subsume (7b) nor (7b) subsume (7a).

(7) a. $\begin{bmatrix} per & 3 \\ num & pl \end{bmatrix}$ b. $\begin{bmatrix} per & 3 \\ gen & fem \end{bmatrix}$ c. $\begin{bmatrix} per & 3 \\ num & pl \\ gen & fem \end{bmatrix}$

Coindexing

To capture the idea that an output feature structure (in a VI) corresponds to an input feature structure we need a notion of coindexing. Feature structures in the input are uniquely identified by their position in the input string, i.e. the index of a feature structure $FS_i, 1 \leq i \leq n$ in an input string $FS_1 \ldots FS_n$ is simply i.

Matters are somewhat more complex for feature structures in the output. So we might want to say that the [+pl] in (8b) corresponds (i.e. is coindexed) to both input feature structures in (8a):

(8) a. $[+1\ +\text{pl}\ +\text{Nom}]_1$ $[+2\ +\text{pl}\ +\text{Acc}]_2$
 b. g [+2] xedav t [+pl] ('we see you (pl.)')

In other words, output FSs must be able to correspond to sets of indices. In all cases, indices will be represented as subscripts. The fact that [+pl] in (8b) is coindexed with both input FSs can now be expressed as (9):

(9) $[+\text{pl}]_{1,2}$

Parsing

Following early OT terminology (Prince and Smolensky, 1993), indexed FSs are said to parse features of FSs if they specify these features and correspond to the input FS. This notion is crucial for defining constraints on feature realization.

(10) An indexed feature structure IFS parses a feature structure FS_{anchor} in a feature structure FS_{input} iff IFS and FS_{input} are coindexed and FS_{anchor} subsumes $Feat(IFS)$

Feat(IFS) is IFS without indexes; e.g. Feat($[+\text{pl}]_{1,2}$) = [+pl]. Following this definition, (12a) parses [*per* 3] in the second and third feature structure of (11), but (12b) parses [*per* 3] only in the second one since it is not coindexed with the third one. Again due to coindexing, (12c) parses no feature structure in the second FS of (11) and three feature structures in the third one: [*per* 3], [*gen mas*] and $\begin{bmatrix} gen & mas \\ per & 3 \end{bmatrix}$

(11) $[Stem+]_1 \begin{bmatrix} gen & fem \\ per & 3 \\ case & Nom \end{bmatrix}_2 \begin{bmatrix} gen & mas \\ per & 3 \\ case & Acc \end{bmatrix}_3$

(12) a. $\begin{bmatrix} per & 3 \end{bmatrix}_{2,3}$ b. $\begin{bmatrix} per & 3 \end{bmatrix}_{2}$ c. $\begin{bmatrix} gen & mas \\ per & 3 \end{bmatrix}_{3}$

3.2.3 Vocabulary Items

Vocabulary Items have already been presented in our discussion of DM and MM. Of course it is not conceptually necessary to assume VIs, but the discussion of AM in 2.1.3 has shown that a completely affix-less theory has serious disadvantages. In DO VIs have roughly the structure as in DM and I will only note three departures here.

First, VIs have no specification of their affixal status (prefix or suffix), because this is derived from general principles as discussed at length in chapters 5 and 6.

Second, the content of VIs contains (finite) sets of feature structures (possibly of cardinality 1), not single FSs. In other words, portmanteau VIs are possible.

Third, context specifications of VIs are parameterized as to whether they refer to underlying heads or surface VIs.

Portmanteau VIs

Portmanteau VIs are necessary to account for portmanteau affixes such as Quechua -*q* in *rika*-*q*, 'I see you' which is used if the subject is 1st and the object is 2nd person. A 2nd person object is otherwise marked by *-shu* as in *rika-shu-nki*, 'he sees you' and a 1st person subject is otherwise marked by *-V* (an underspecified vowel suffix) as in *punu-u*, 'I sleep'. (Lakämper and Wunderlich, 1998:122ff.). The need for portmanteau VIs will become especially clear in the discussion of direction marking morphology (chapter 7).

Context Specifications

Apart from portmanteaus, context specifications for VIs are also needed. This can be seen from the Georgian imperfect marker, which is *-i* in the general case but *-n* with 3pl marking:

(13) a. *xedavd-**i**-t* 'you (pl.) saw'
see-IMPF-PL

b. *xedavd-**n**-en* 'they saw'
see-IMPF-S3p

While contextually restricted VIs are like portmanteaus in that they refer to features of two underlying heads, they differ in their distributional properties. Thus, *-n* in (13b) does not block the appearance of the person marker *-en* while *-q* in Quechua blocks the appearance of all other agreement affixes. In fact a Georgian portmanteau corresponding to *-n* also exists: *-a* marks imperfect *and* 3sg and exempts the person marker *-s*:

(14) a. *xedav-s* 'he sees'
see-S3s

b. *xedavd-a/*xedavd-a-s* 'he saw'
see-IMPF:S3s

As discussed in chapter 6, portmanteaus, especially direction markers also have different positional properties than simple VIs (whether contextually restricted or not).

In (13), it remains unclear if the context restriction of *-n* should refer to the underlying 3pl head or to the adjacent 3pl VI *-en*. Actually in this case both possibilities lead to the correct result. I will argue that VIs have both possibilities and can specify whether a context specification refers to underlying heads *or* other VIs. This is necessary in a two-level-system such as DO since contextual restrictions of affixes sometimes need to refer to features not explicitly represented at the surface. An example are the Menominee verbal agreement affixes which differ in most instances for independent and conjunct order[2], even if there is no overt sign of the order category: *po·se-**w*** (independent) *po·se-**t*** (conjunct), 'he embarks' [3].

[2] See 7.1 for the use of conjunct and independent order forms.

[3] Another reason is to avoid proliferation of locality restrictions. Thus the 3rd person prefix *o-* in Menominee is restricted to the context of negation: *po·se-**w***, 'he embarks' vs. *o-po·se-n-an*, 'he does not embark'. While o- clearly is not adjacent to the negation marker on the surface, agreement, of which *o-* is an exponent, is adjacent to Neg underlyingly.

On the other hand, we also need surface contexts, as shown by the Albanian 1st person agreement affix, which is *-a* in the default case, and *-j* in the present indicative active:

(15) a. *puno-j-**a*** 'I worked (imf.)'
work-IMPF-S1s

b. *puno-v-**a*** 'I worked (aor.)'
work-AOR-S1s

c. *puno-fsh-**a*** 'I should work (opt.)'
work-OPT-S1s

d. *puno-**j*** 'I work (pres.)'
work-S1s

The most simple account is to say that *-j* is restricted to contexts where it is to the right of the stem. This statement cannot be reduced to an underlying context restriction because underlyingly there will be a tense head even in the present cannot be replaced by restricting *-j* to (underlying) present tense, since this would predict *-j* for the optative present (**puno-fsh-j*). Surface-context restrictions are also the only restrictions of stipulated position marking on affixes. Thus, the Quechua plural marker *-ya* is restricted to the position to the right of a verb stem, which accounts both for its distribution (contrasting with the nominal plural marker *-kuna*) and its deviant position before all person marking (see chapter 6 for discussion).

Structure of VIs

Formally, a VI is a triple $< Phon, Feat, Cont >$, where $Phon$ is a phoneme string, $Feat$ a set of feature structures and $Cont$ a set of context specifications. I will refer to the parts of a VI by function expressions such as Feat(VI). The notation will be close to the one developed in classical DM, following the scheme:

(16) $Phon \leftrightarrow Feat\ Cont\ (ContextRestrictions)$

(17) shows some of the VIs already discussed in the notation used in the rest of this thesis. A context specification introduced with "/" refers to surface VIs parameterized in the manner of context-sensitive rules to the right (c.) or left (f.). In underlying context specifications introduced by "//", no indication of the context direction is made since it remains somewhat unclear in the literature how such reference should be expressed (for some discussion see Halle and Marantz, 1993; Bobaljik, 1999a,b; Trommer, 1999c).

(17) a. /q/ $\leftrightarrow$ [+1 +Nom] [+2 +Acc]
b. /i/ $\leftrightarrow$ [+impf]
c. /n/ $\leftrightarrow$ [+impf] / __ [+3 +pl]
d. /w/ $\leftrightarrow$ [+3]
e. /t/ $\leftrightarrow$ [+3] // [+conj]
f. /j/ $\leftrightarrow$ [+1] / [+Stem] __

Since portmanteau VIs contain *sets* of FSs, the order of FSs is arbitrary: [+1 +Nom] [+2 +Acc] in (17a) could also be written [+2 +Acc] [+1 +Nom].

3.2.4 The Structure of GEN

It is common in OT phonology to assume that GEN contains virtually all possible phonological structures as long as some reference to the input (for comparison) and adequate coindexation is guaranteed. DO departs from this general strategy only in two minor respects. GEN in DO bans insertion of morphosyntactic features not present in the input strings and allows no violations of VI context specifications. Otherwise the candidate set provided by GEN for a candidate consists of the set all possible strings of VIs (including indexation of FSs) available in a language.

No Insertion of Features

No insertion of features means minimally that there are no output feature structures with no correspondences in the input. Hence GEN forbids FSs in the output which do not bear indices, or bear indices not present in the input. Feature insertion in a stricter sense would mean that there is an output feature structure FS_o coindexed with an input feature structure FS_i and FS_o contains features not present in FS_i. This is blocked by the requirement that a FS in the output must subsume all FSs in the input with which it is coindexed. Hence a VI containing the FS $[+1\ +\mathrm{pl}]_1$ cannot realize the feature +pl from an input FS $[+2\ +\mathrm{pl}]_1$ since [+1 +pl] does not subsume [+2 +pl]. +2 is what is referred to here as an "inserted feature". (18) summarizes the relevant constraints on GEN:

(18)
a. Each FS in the output has at least one index
b. Output FSs bear only indices from the input string
c. An output FS subsumes all FSs in the input with which it is coindexed

Meeting Context Requirements

Recall that there are three types of context restrictions which have to be met in the following way.

(19) a. / __ F is met iff F subsumes some F_l in an VI right-adjacent to the VI containing the context restriction

b. / F __ is met iff F subsumes some F_r in an VI left-adjacent to the VI containing the context restriction

c. // F is met iff there is a FS F' subsumed by F in the input string and F' is adjacent to some input FS coindexed with the VI containing the context restriction

For example the context specification of *t* in (20b) is met since its correspondent $[+3\ +\text{sg}\ +\text{Nom}]_2$ is adjacent to [+conj] in the input string in (20a) and [+conj] subsumes $[+\text{conj}]_3$.

(20) a. $[+\text{stem}]_1$ $[+3\ +\text{sg}\ +\text{Nom}]_2$ $[+\text{conj}]_3$

b. po·se $[+\text{Stem}]_1$ t$[+3]_2$ //[+conj]

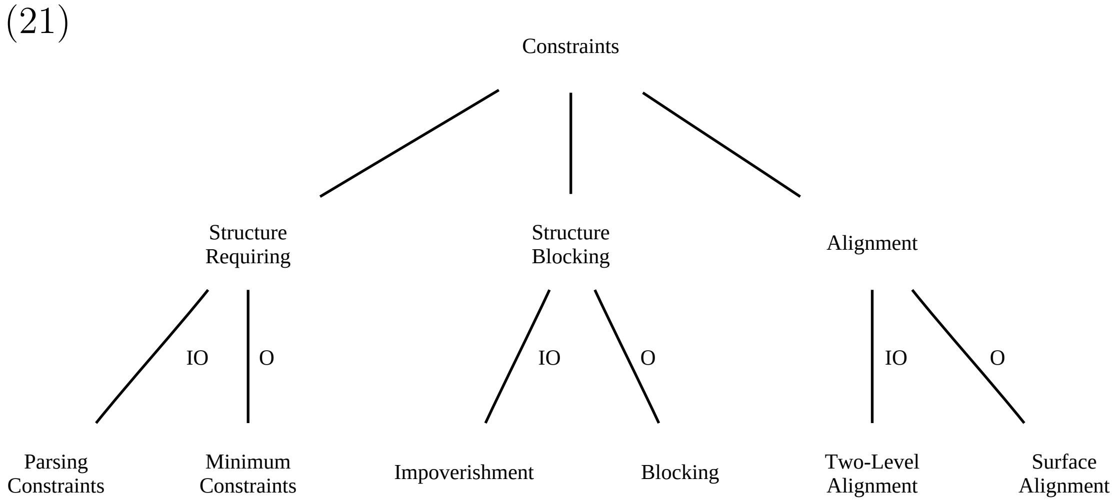
3.3 Constraint Types

DO Constraints are of three basic types, which will be treated in due course:

- Structure Requiring (section 3.3.1.)
- Structure Blocking (section 3.3.2.)
- Alignment Constraints (section 3.3.3.)

Apart from some peripheral constraint types all constraints used in this thesis belong to these three types. All three of these types are represented in output versions (O) and input-output versions (IO):

(21)



Thus, blocking constraints (such as output constraints) block affixes regardless of any underlying FSs, while impoverishment (input-output) constraints prevent the realization of affixes corresponding to specified inputs. It would clearly be desirable to restrict constraint types even more, but this leads to empirical difficulties (see section 4.3).

3.3.1 Structure Requiring Constraints

Constraints of this type require the existence of certain VIs in the output under specified conditions. Hence all of them have the form:

(22) $(X \Rightarrow) \ldots \exists VI \ldots$

Minimum Constraints

Languages often impose minimum requirements on the appearance of morphemes. For example in Classical Nahuatl nouns have to carry at least one affix. If no meaningful affix is justified for the form the semantically empty 'absolutive' affix *-li* appears:

(23)	*no-cal*	*cal-tin*	*no-cal-huan*	*cal-li/*cal*
	my-house	house-pl	my-house-pl	house-abs
	'my house'	'houses'	'my houses'	'house'

I attribute such behavior to minimum constraints.[4] The only type of minimum constraint that will be used here is written $MINIMUMFS$ and requires that there is at least one VI in the output string that contains a VI subsumed by FS

(24) **MINIMUM FS:** Count a constraint violation if the output string contains no VI with a feature structure subsumed by FS.

Assuming that the relevant affixes can be characterized by a feature F distinguishing functional from lexical items the Nahuatl fact can now be attributed to a high ranked constraint $Minimum[F]$.

PARSE Constraints

GEN is constructed in a way that does not require any of the input features to be realized in the output.[5] The tool to achieve this are

[4]A similar constraint type is proposed by Noyer (1992:101) to account for default prefixes in Semitic. A further case where a minimum constraint emerges are Yurok agreement suffixes, to be discussed in 4.1.

[5]The constraint architecture here departs somewhat from the one used in phonological Correspondence Theory as in McCarthy and Prince (1994). The differences will be discussed in 4.2.

PARSE Constraints. The most self-evident interpretation of parsing constraints is to interpret a notation as "PARSE FS" in the following way:

(25) **PARSE FS :** Count a constraint violation for each feature structure FS' in the input that is subsumed by FS and not realized by a feature structure in the output that parses FS in FS'.

One further complication is necessary to accommodate hierarchy effects in agreement which are sensitive to input features not present in the output. Thus, in Western Warlpiri in the case of agreement with two dual DPs only one dual feature can be realized.[6] If a [+2] and a [+3] DP are involved, the surviving dual marker is the one corresponding to 2nd person duality (agreement with the other DP is plural).

(26)	*njumpala-ḷu*	*ka-n-**pala**-tjana*	*wawiri-patu*	*nja-nji*
	you-ERG	pres-2-dual-3pl	kangaroo-paucal	see-nonpast

‘You two see the several kangaroos’ (p. 329)

However *-pala* cannot contain the specification [+2]: While being restricted to subject agreement (so we know that it corresponds to the

[6] See 7.2 for more details.

[+2] argument in (26)), it also expresses dual for[+3] subjects as in (27):

(27) *ŋarka-tjara-ḷu ka-Ø-tju-**pala** ŋatju nja-nji*
man-dual-ERG pres-3-1-dual me see-nonpast
'The two men see me' (p. 328)

Thus the ranking PARSE [+2 +dual] ≫ PARSE [+3 +dual] would not have the desired effect to favor *-pala* over the competing dual marker since *-pala* does not realize [+2 +dual], but only [+Nom +du]. What we need to say is roughly the following: "If there is a head in the input that is [+2] then the dual feature of this head should be realized in the output." I formalize this by assuming that PARSE constraints are not parameterized by one feature structure ("FS" in (25)), but by two where one feature structure ($\mathrm{FS}_{\mathrm{Anchor}}$) specifies the input feature structure which triggers application of the constraint, and the second one ($\mathrm{FS}_{\mathrm{Target}}$) the features which should be realized in the output:

(28) **PARSE** $\mathbf{FS_{Target}}^{\mathbf{FS_{Anchor}}}$: Count a constraint violation for each feature structure FS' in the input that is subsumed by FS_{Anchor} and not realized by a feature structure in the output that parses FS_{Target} in FS'.

Now the preference for dual marking of [+2] arguments can be captured as PARSE $[\text{du}]^{[+2]}$ ranked above PARSE $[\text{du}]^{[+3]}$, as in (29):

(29) **Input:** $[\text{+Nom +2 + du +pl}]_1[\text{+Acc +3 +du +pl}]_2$

	BLOCK [du]	PARSE $[\text{du}]^{[+2]}$	PARSE $[\text{du}]^{[+3]}$	PARSE [pl]
☞ $[\text{+Nom +du}]_1[\text{+Acc +pl}]_2$			*	
$[\text{+Nom +pl}]_1[\text{+Acc +du}]_2$		*!		
$[\text{+Nom +du}]_1[\text{+Acc +du}]_2$	*!			
$[\text{+Nom +du}]_1$			*!	*

That no two dual markers can appear is again effected by a BLOCK constraint. PARSE [pl] ensures that the [+3] argument is at least realized by a plural marker. Note that constraint violations can only be assigned on the basis of the indices between input and candidate VIs.

The format in (28) generalizes the one in (25). "Simple" PARSE constraints following the notation "PARSE FS" can now be interpreted as "PARSE FS^{FS}". Thus "PARSE [pl]" in (29) is simply an abbreviation for "PARSE $[\text{pl}]^{[\text{pl}]}$".

3.3.2 Structure Minimizing Constraints

The common feature of structure-reducing Constraints is that they disallow features to surface even if these are licensed by the input. Since feature realization is bound to VIs this results in the converse of structure requiring constraints, i.e. structure reducing constraints require the non-existence of certain VI types under certain conditions:

(30) $(X \Rightarrow) \ldots \neg\exists VI \ldots$

BLOCK Constraints

Blocking constraints account for cases where one and only one affix of a certain kind is licit:

(31) **BLOCK** ... : Count a constraint violation if there is more than one VI in the output of the type specified in the constraint.

As a familiar example recall the case of English inflectional affixes already discussed in 3.1. At first glance it might seem desirable to replace Blocking by more general economy constraints minimizing structure up to zero, and to derive the result of "surviving single affixes" by independently needed PARSE constraints. Let us return to English verb inflection to see that this would not get the desired effects. (32a) is the ranking from (3), (32b) a ranking with a hypothetical minimum constraint (MIN) requiring minimal (i.e. optimally zero) affixes:

(32) a. BLOCK Suffix,PARSE [+past] $\gg$ PARSE [+3]

b. PARSE [+past] $\gg$ MIN $\gg$ PARSE [+3]

Note that PARSE [+past] has to be ranked over Min in (32b) to allow exponence of Tense in *(I) wait-ed.* Conversely PARSE [+3] has to be ranked below MIN to guarantee blocking of -*s* in *(he) wait-ed(*-s).* But this ranking will lead to the wrong result for the input [-past][+3] (3rd person present tense), where -*s* should be absent:

(33)

Input	... MIN ...	... BLOCK Suffix ...	Output
[-past][+1]	☞	☞	*wait*
[-past][+3]	☚ *wait*	☞	*wait-s*
[+past][+1]	☞	☞	*wait-ed*
[+past][+3]	☞	☞	*wait-ed*

Parameters of BLOCK Constraints

Blocking is sensitive to three parameters: position, type and complexity. This can be seen more clearly in Georgian:

(34) a. *v-xedav* 'I see'
[+1+Nom]-see

b. *g-xedav* 'I see you (sg.)'
[+2+Acc]-see

c. *g-xedav-s* 'he sees you (sg.)'
[+2+Acc]-see-[+3+Nom+sg]

g- and *-s* are both agreement affixes, but there is no blocking because *g-* is a prefix and *-s* a suffix. *g-* blocks *v-* however since this is also a prefix. Thus while blocking in Georgian is always between agreement affixes we need two blocking constraints where one is restricted to the **position** before the stem and the other to the post-stem position. More generally blocking constraints must be able to make explicit reference to the position in which they have to be applied.
The importance of specifying the **type** of relevant items in blocking constraints becomes evident if we compare English and Georgian. Recall that in English tense and agreement affixes block each other. In Georgian, there is no blocking between agreement- and tense suffixes like the screeve vowel *-i* that appears in the aorist:

(35) *v-xedavd-i-t* 'we saw'
S1-see-IMPF-PL

This is captured straightforwardly if we assume that PARSE constraints explicitly specify the type of the VIs subject to blocking.

The **complexity** parameter is relevant for the already discussed phenomenon that portmanteau affixes as the fused Agr-Tense marker in Georgian can cooccur with simple (i.e. for non-portmanteau) agreement even if two simple agreement markers are impossible.

(36) *g-xedavd-a-t* ‘he saw you (pl.)’
2-see-IMPF:S3s-PL

In other words, the blocking constraint minimizing Georgian suffixes is restricted to simple (non-portmanteau) affixes. Languages exhibiting blocking constraints restricted to complex VIs will be discussed in chapter 7.

Taking these parameters into consideration the most general form of a blocking Constraint is BLOCK $(FS_1, dir, FS_2, \alpha Compl)$, where FS_1 is a FS that describes the feature content of blocked vocabulary items, $\alpha Compl$ specifies whether (non)complex items are involved and dir FS_2 (where $dir \in \{\prec, \succ\}$) fixes the relevant position where the constraint applies, before ($\prec$) or after ($\succ$) a VI containing a FS subsumed by FS_2. The blocking of Georgian agreement suffixes can now be captured as:

(37) BLOCK $([+AGR], \succ, [+Stem], -Compl)$

The specification of complexity and position can also be left underspecified. Thus (38a) would imply that all agreement suffixes (whether complex or not-complex) are in a blocking relation and (38b) that blocking holds for all agreement affixes prefixally or suffixally:

(38) a. BLOCK $([+AGR], \succ, [+Stem])$
b. BLOCK $[+AGR]$

Impoverishment Constraints

Impoverishment constraints are the constraint pendant to impoverishment rules in Classical DM. Under an OT perspective they can be conceived as Anti-Parsing constraints, i.e. constraints prohibiting parsing. Apart from a FS specifying the feature set not to be parsed, they are also parameterized by a further feature structure stating an input condition on their applicability. A case where this is necessary is colloquial Ainu (Shibatani, 1990), where the number of a second person argument is neutralized in certain constellations and the general [+2] marker appears as in plural forms instead of the 2sg markers (see 4.3.3). This is formulated as an impoverishment constraint as IMPOVERISH $[+\text{sg}]^{[+2]}$, where [+2] specifies the underlying feature structure which triggers impoverishment but is not actually blocked, and [+sg] marks the feature structure that is required not to surface. $IMPOVERISH$

${FS_{Target}}^{FS_{Trigger}}$ is evaluated as follows:

(39) **IMPOVERISH** ${FS_{Target}}^{FS_{Trigger}}$: Count a constraint violation if there is a VI in the output that parses FS_{Target} in an input FS subsumed by $FS_{Trigger}$.

$FS_{Trigger}$ is optional or, in other words, "IMPOVERISH FS" is an abbreviation for "IMPOVERISH FS$^{[\ ]}$.

3.3.3 Linearity Constraints

Alignment

The third major constraint type in DO are alignment constraints, which are a severely restricted subtype of the Generalized Alignment (GA) family from McCarthy and Prince (1993). GA constraints require specified edges of different types to coincide. For example the following constraint demands that all left edges of prosodic words coincide with the left edge of some foot:

(40) ALIGN(PrWd, L, Ft, Wd) (McCarthy and Prince, 1993:13)

GA constraints are computationally the most complex constraint type in OT [7], which makes it highly desirable to restrict them. In DO only two types of alignment constraints are used, referring to the edges of VIs and of the spellout domain. Constraints of the form (41a) require that the left edge of any VI meeting the description *Descr* coincides with the left edge of the spell-out domain while the form (41b) requires that the right edge of any VI meeting the description coincides with the right edge of the spell-out domain.

(41) a. ALIGN $(Descr, <)$
b. ALIGN $(Descr, >)$

"$<$" and "$>$" will be taken here as synonymous with "left" and "right". Alignment can now be interpreted as follows:

(42) **ALIGN ...:** Count a constraint violation for each VI that intervenes between the designated edge of the spell-out domain and a VI of the designated type.

The *designated edge* corresponds to "$<$" or "$>$" in the constraint, *designated type* can refer to the feature content of the VI (FS in (43a) and FS_1 in (43b)), and additionally to that of an input feature structure

[7] Cf. e.g. Heiberg (1999); Eisner (1997); Trommer (1999b).

coindexed with it (FS_2 in (43b)). Finally alignment can be restricted to (non-)complex VIs (43c):

(43) a. ALIGN (FS, dir)

b. ALIGN $({FS_1}^{FS_2}, dir)$

c. ALIGN $(FS,$+/-$Compl, dir)$

Thus the following constraints all require VIs containing some [+AGR] FS to be as close as possible to the left edge, but in (44b) this holds only for VIs coindexed with a [+Nom] input FS and in (44c) only for complex VIs.

(44) a. ALIGN $([+AGR], <)$

b. ALIGN $([+AGR]^{[+Nom]}, <)$

c. ALIGN $([+AGR]_{+Compl}, <)$

As a convenient shorthand for alignment constraints I will use the notation L ⇦ for left and ⇨ R for right alignment. This is illustrated for the examples of (44) in (45):

(45) a. L ⇦ [+AGR]

b. L ⇦ $[\mathrm{+AGR}]^{[\mathrm{+Nom}]}$

c. L ⇦ $[\mathrm{+AGR}]_{\mathrm{+Compl}}$

REFLECT

REFLECT constraints require that the output correspondents of specified input items reflect the position of their “hosts”. This is designed especially for agreement categories which are assumed to be adjoined to functional categories like Tense. The host relation is captured simply by left-adjacency in the input string, which is required to map to the same relation in the output.

(46) **REFLECT FS :** For all input FS F_1 that are right-adjacent to another FS F_0, and subsumed by FS, where both F_1 and F_0 have correspondent VIs in $Cand$: Count a constraint violation if $Cand$ is not of the form $V^* \; {V_0}^* \; {V_{0/1}}^* \; {V_1}^* \; V^*$

where V_0 stands for VIs coindexed with F_0, but not with F_1, V_1 for those coindexed with F_1, but not with F_0, and $V_{0/1}$ for those that are coindexed with both. V denotes the VIs coindexed with neither. The Kleene star ("*") is used to denote arbitrary many (possibly zero) instances of a VI.

As an example take Georgian and the inputs I_a = [+Stem]$_1$ [+Past]$_2$ [+AGR +Nom +3 +pl]$_3$ and I_b = [+Stem]$_1$ [+Past]$_2$ [+AGR +Nom +3 +sg]$_3$. The following outputs both satisfy REFLECT [+AGR] for the respective inputs, while putting -*en* in any other position w.r.t -*n* would induce a constraint violation.

(47) a. *xedavd* *-n* *-en* 'they saw'
see$_1$ [+past]$_2$ [+3+pl]$_3$

b. *xedavd* *-a* 'he saw'
see$_1$ [+past]$_2$ [+3+sg]$_3$

Note two subtleties: REFLECT does not require that there must be a reflecting output VI at all. If an input FS is not parsed at all in a candidate, this causes no constraint violations. Moreover if there is more than one VI parsing FS only one of them is required to reflect the underlying position.

3.3.4 Other Constraint Types

OCP constraints

The OCP (Obligatory Contour Principle), which is originally a purely phonological constraint, has been applied to morphology among others by Grimshaw (1997),Gerlach (1998) and Yip (1998) to explain data such as certain opacity effects in Romance clitic clusters. For example, in Italian the impersonal ('one') and the reflexive clitic ('him-/herself') in isolation both have the form *si*, while the first *si* is replaced by the first plural clitic *ci* when both are combined (Grimshaw, 1997:12):

(48) *Ci* *si* *lava* 'One washes oneself'
one oneself washes

Grimshaw (1997) assumes a constraint which she writes *XX to prohibit sequences of identical clitics. The formal nature of this is somewhat unclear, since the constraint also seems to block the cooccurrence of clitics that are not strictly identical phonologically or morphologically, such as *le* (dative feminine singular) and *lo* (accusative masculine singular). Because of the highly restricted ordering of clitic groups the data do not even show that linear adjacency is a necessary prerequisite for the blocking effect. Technically this means that OCP constraints can be implemented as blocking constraints, given that there is a consistent characterization of the class that induces the OCP effect in terms of a feature structure.

COHERENCE

COHERENCE constraints require that input FSs are represented by maximally coherent sequences of VIs: For example in the Warlpiri auxiliary form of (49), where *-n* and *-pala* correspond to an input like [+Nom +2 +du] and *-tjana* to [+Acc +3 +pl], COHERENCE [+AGR] favors the orders { *-n*, *-pala* } $\succ$ *-tjana* and *-tjana* $\succ$ { *-n*, *-pala* } over orders like *-n* $\succ$ *-tjana* $\succ$ *-pala*, where *-tjana* "breaks up" the coherence of coindexed items:

(49) *njumpala-ḷu ka-n-pala-tjana wawiri-patu nja-nji*
you-ERG PRES-2-DU-3pl kangaroo-PAUC see-NPast
'You two see the several kangaroos' (p. 329)

COHERENCE constraints have the form COHERENCE FS. FS gives a description of the VIs subject to the constraint paralleling the descriptions in blocking constraints. This then is interpreted as:

(50) **COHERENCE** ... **:** In an output with more than one simple VI meeting the constraint description, count a constraint violation for each such VI (immediately) preceded by another one with a different index set.

"Immediately preceded" here does not refer to the output string, but rather to the string of VIs meeting the constraint description (represented by "..." in (50)). For example, COHERENCE [+AGR] would be violated by $[+AGR]_1$ $[+AGR]_2$ $[+AGR]_1$ but not by $[+AGR]_1$ $[+STEM]_2$ $[+AGR]_1$. In fact, constellations like the second are rather common in natural languages. This constraint type appears to be only applicable to non-complex VIs, as I have found no case where it seems feasible to extend it to portmanteaus, where the interpretation of this constraint type is difficult.

The description can also contain the requirement that certain features are not specified Thus COHERENCE ([+AGR], NOT([+CASE]) requires index identity only for agreement VIs that are not specified for case features.

An extreme effect of this formulation is that it makes it desirable to suppress the expression of input FSs if there are two categories to be expressed leading to a change in indexing. A case from Dumi where a coindexing constraint lead to this result is discussed in 7.2.3.

FIDELITY

While it is technically possible to get multiple indices on simple feature structures as in (9), repeated here as (51):

(51) $[+pl]_{1,2}$

the standard case is that a feature structure in a VI realizes only features of one input FS. FIDELITY constraints ban multiple indices for feature structures:[8]

[8] A similar constraint on phonological units is called "UNIFORMITY" in McCarthy and Prince (1995:310,371).

(52) **FIDELITY** F**:** Count a constraint violation for each output FS which is subsumed by the feature structure F and has more than one index.

Note that a portmanteau item indexed as $[+\text{Nom} +1 +\text{sg}]_1$ $[+\text{Acc} +2 +\text{pl}]_2$ does not induce the violation of a FIDELITY constraint since the single FSs of the VI have only one index.

CONTEXT-MAXIMIZATION

In standard DO, insertion of a VI with a context specification is favored over an otherwise equal one without a context specification. For an example recall the case of 1sg allomorphy in Albanian (15), repeated here as (53):

(53)

a. *puno-j-**a**,* 'I worked (imf.)'
work-IMPF-S1s

b. *puno-v-**a**,* 'I worked (aor.)'
work-AOR-S1s

c. *puno-fsh-**a**,* 'I should work (opt.)'
work-OPT-S1s

d. *puno-**j**,* 'I work (pres.)'
work-S1s

Assuming the following VIs, in the present tense either /j/ or /a/ is possible:

(54) a. /j/ $\leftrightarrow$ [+1] / [+Stem] ___

b. /a/ $\leftrightarrow$ [+1]

To capture the effect that the item with a context specification is chosen, I assume a general constraint requiring presence of context specifications:

(55) **CONTEXT-MAXIMIZATION**: Count a constraint violation for each output VI without context specification.

This constraint must likely still be refined and split up into subconstraints to guarantee that more specific (or multiple) contexts are preferred over less specific (or singular) ones, similar to PARSING constraints, but I will not go into this here.

3.3.5 Constraint Contexts

A general parameter of constraints is the use of context specifications. For example impoverishment constraints typically only hold in certain tenses or moods. For PARSE constraints recall from 2.2.5 that in Dumi generally only one argument is marked by agreement where the choice depends on the ranking of the feature hierarchy $1 \gg 2 \gg 3$. As noted in 2.2.6, there is one exception to this: the combination of 2sg subjects and 3rd person objects, where the "lower" 3rd person subject is realized instead. To express the fact that this parsing requirement ranks out the other PARSE constraints but only in this special constellation, I assume a PARSE constraint restricted by a context specification:

(56) PARSE [+3 +sg] / [+2 +Acc]

Context specifications of constraints always refer to input FSs. Constraints with context specifications are interpreted the same way as those without, with the only difference being that they are only applied if every feature structure in a context specification subsumes at least one FS in the input.

3.4 Deriving Basic Facts about Inflectional Morphology

In this section, I show how DO allows us to derive some basic formal properties of inflectional systems, such as the Elsewhere Principle and the ban on redundant affixes. The basic idea is that phenomena such as these which seem to be language-independent are not the result of specific OT-constraints, which would make them violable and hence language-dependent. Rather, they derive from the construction of the theory (especially GEN) and plausible general assumptions about the constraint inventory. More concretely, I will assume the following:

- Only the constraint types introduced in section 3.3) are used.
- Each VI is subject to at least one alignment constraint.[9]
- For all feature structures FS subsuming any feature structure found in a VI, there is a constraint PARSE FS .

The first assumption is rather trivial. Not much could be said about the formal properties of an OT grammar if the nature of the constraints used is not restricted in some way. The other assumptions impose a kind of minimum requirement on constraint inventories which are necessary to guarantee the realization of underlying features and the ordering of VIs.

[9] An obvious way to ensure this is to require that each VI contains at least one feature specification and there is an alignment constraint for each feature.

3.4.1 No Feature Insertion

No Insertion of features means that all features in a word form have to be licensed by features in the input. In DO this is a consequence of the way GEN is constructed: Since no candidate can contain a VI with an inserted feature, and since the set of optimal candidates is a subset of the candidate set generated by GEN, no optimal candidate can involve feature insertion. Possible counterevidence against the ban on feature insertion will be discussed in 4.1.

3.4.2 Underspecification

It is common in the morphological literature that affixes are assumed to be underspecified w.r.t. their input. That this is an option in DO again follows from the construction of GEN: All VIs for which all feature structures subsume some input feature structure are possible parts of a candidate. Underspecification in optimal candidates may come from two sources. *First*, there may simply be no vocabulary item in the language that would be able to parse a particular feature of a given input feature structure . This effect can be illustrated by a hypothetical example: Assume an input [+1 +pl] and a VI inventory containing only the item /t/ [+pl]. GEN will generate the candidate set $\{t[+pl]\}^*$ (strings of t[+pl] of arbitrary length), all of which are underspecified w.r.t. +1. Since the output set is a subset of the candidate set this also holds for the optimal candidates. A second type of underspecification is given when a feature could be expressed by an adequate VI, but constraints block its appearance in a specific output-form, which I call "Deep Underspecification". Again an imaginary example will illustrate this possibility. Take again the input I =[+1 +pl] and the VI inventory V = {/t/[+pl], /gv/[+1 +pl] }. The candidate set for I is V*. Given a constraint ranking that consists exclusively of the constraint IMPOVERISH [+1 +pl], the set of optimal candidates reduces to {/t/[+pl}*. Therefore, this time we have underspecification triggered by a constraint.

3.4.3 Non-Redundancy

In classical DM, single affixes are inserted into syntactic nodes, which blocks in a natural way more occurrences of affixes than are licensed by the syntactic input. A similar (but not identical) effect is achieved in Minimalist DM (see 2.2.4) by the requirement that all vocabulary insertion is feature consuming. Since VIs consume features uniformly, the same VI can only be inserted twice if the features it deletes are given twice underlyingly. In MM, non-redundancy has the status of an explicit constraint:

(57) **Non-Redundancy-Principle:** The output information [of an inflectional affix] must not be contained in the input. (Wunderlich and Fabri, 1994:262)

An explicit constraint such as this is superfluous in DO since redundancy (i.e., non-motivated affix repetition) is already excluded by a seemingly unrelated device: Alignment constraints.

To see this, let us compare two hypothetical output candidates, $Cand$ and $Cand'$, for a given input which differ from each other minimally in that $Cand'$ contains one more instance of an indexed VI[10] which is also present in $Cand$ (i.e. $Cand = V_1 \ldots V_l V_r \ldots V_n$ and $Cand' = W_1 \ldots W_l X W_r \ldots W_n$ where $W_i = V_i, \exists i, 1 \leq i \leq n | X = V_i$. I will call W_i the VI instance *corresponding* to V_i.

I will now show that $Cand'$ is worse (i.e., it is suboptimal) than $Cand$ for at least one PARSE constraint and at least as bad as $Cand$ for all other constraints. From this it follows that $Cand'$ is less optimal than $Cand$ under all possible rankings.

[10]Note that VI here and in the following is understood as VI plus a specific indexing of its component FSs. The same VI with two different indexations is interpreted here as two different VIs.

MINIMUM Constraints

If $Cand$ violates $MINIMUM\ FS$ it follows that no VI instantiated in it fulfills the description of FS. Since $Cand'$ is only composed of VIs also present in $Cand$, there is also no VI in $Cand'$ that fulfills the description, and $Cand'$ also violates the constraint. Hence $Cand'$ cannot be more optimal than $Cand$ for $MINIMUM\ FS$

PARSE Constraints

The same point is true for the application of PARSE constraints which act crucially like MINIMUM constraints.

BLOCK Constraints

If $Cand$ violates BLOCK FS, there must be at least two VI instances in $Cand$ meeting FS. Since for every VI instance in $Cand$ (V_i) there is a corresponding instance of the same VI in $Cand'$ (W_i), the latter also contains two such VIs and hence also violates BLOCK FS. This also carries over to BLOCK $(FS_1, dir, FS_2(\alpha Compl))$, where the blocking effect is dependent on the context: Again for all VI instances V_k meeting the context specification (FS_2) in $Cand$, there is a corresponding W_k in $Cand'$, which is in the right linear position because $V_s \prec V_t$ iff $W_s \prec W_t$.

Impoverishment Constraints

Assume that $Cand$ violates $IMPOVERISH\ {FS_{Target}}^{FS_{Trigger}}$. There is then a VI instance V_i in $Cand$ that parses FS_{Target}. For $V_i = W_i$, $Cand'$ also contains a VI instance parsing FS_{Target} and violates the constraint.

COHERENCE

Since all VIs that do not meet the description of a COHERENCE constraint COH are irrelevant for determining constraint violations, I will only treat $El(COH, Cand)$ and $El(COH, Cand')$, where the function $El()$ eliminates all members of a string that do not meet the constraint description. If X does not meet the description, then $El(COH, Cand) = El(COH, Cand')$ and $Cand'$ is trivially as bad as $Cand$ for COH. Otherwise, let $El(COH, Cand)$ be $F_1 \ldots F_k F_p \ldots F_m$ and $El(COH, Cand')$ be $M_1 \ldots M_k X M_p \ldots M_m, M_i = F_i$.

All $M_{1\ldots k}$ and $M_{p+1\ldots m}$ in $Cand'$ are preceded by instances of exactly the same items as the corresponding items in $Cand$. Hence for each constraint violation induced by them in $Cand$, there is a corresponding violation in $Cand'$. If F_p induces no violation of COH, again $Cand'$ cannot be more harmonic than $Cand$. Otherwise there are two possible constellations (j and i, $j \neq i$, $j \neq k$ are index sets):

(58) a. $\ldots {M_k}^i X^k {M_p}^j \ldots$

b. $\ldots {M_k}^i X^j {M_p}^j \ldots$

In the first case, M_p induces a constraint violation, as in $El(COH, Cand)$, and $El(COH, Cand')$ cannot be better than the latter. In the second case M_p does not induce a constraint violation, but X induces one having no correspondent in $El(COH, Cand)$, which produces the same result.

FIDELITY and CONTEXT-MAXIMIZATION

In both constraint types, all VI instances of a certain type induce one constraint violation. Since for each VI instance V_i in $Cand$ there is an instance W_i of the same VI M_i in $Cand'$, $Cand$ is again at least as harmonic as $Cand'$.

REFLECT

Assume that for some input FS, $Cand'$ does not violate REFL. $Cand'$ then is an instance of $V^*\ {V_0}^*\ {V_{0/1}}^*\ {V_1}^*\ V^*$ namely $V^a\ {V_0}^b\ {V_{0/1}}^c\ {V_1}^d\ V^e$, where a, b, c, d are natural numbers. We get $Cand$ if we remove one of the items in this pattern, resulting in one of the patterns in (59):

(59) a. $V^{\textbf{a-1}}\ {V_0}^b\ {V_{0/1}}^c\ {V_1}^d\ V^e$

b. $V^a\ V_0^{\mathbf{b-1}}\ {V_{0/1}}^c\ V_1^d\ V^e$

c. $V^a\ V_0^b\ {V_{0/1}}^{\mathbf{c-1}}\ V_1^d\ V^e$

d. $V^a\ V_0^b\ {V_{0/1}}^c\ V_1^{\mathbf{d-1}}\ V^e$. $V^a\ V_0^b\ {V_{0/1}}^c\ V_1^d\ V^{\mathbf{e-1}}$

As is easy to see, all of these patterns again instantiate $V^*\ V_0{}^*\ V_{0/1}{}^*\ V_1{}^*\ V^*$ hence if $Cand'$ does not violate REFL, neither does $Cand$. It follows that $Cand$ is at least as harmonic as $Cand'$.

Alignment

Each violation of an alignment constraint A is induced by a VI instance V_p that occurs between a designated edge E and some VI instance V_q of a designated type. Now if V_p and V_q occur in $Cand$ in a given order, W_p and W_q will do so in $Cand'$. Consequently for each violation induced by $Cand$ there will be a corresponding violation by $Cand'$ and the latter can not be more optimal than $Cand$ w.r.t. A.

Assuming that each VI is subject to at least one alignment constraint it can be shown that $Cand'$ must actually be less harmonic than $Cand$. By assumption there must be an alignment constraint $Cons$ aligning X to the left or right edge of $Cand'$ and a second instance X' of the VI instantiated by X. If X is closer to the designated edge of $Cons$

than X', as in (60), $Cand'$ induces the violations of $Cons$ also found for $Cand$ plus one more violation by X:

(60) a. **EDGE** ... X ... X' ...

b. ... X' ... X ... **EDGE**

If X' is closer to the designated edge we can distinguish three cases. For simplicity I will assume that the designated edge is left, but the argument holds in a mirror fashion for the right edge as well. (61a) illustrates the case that all further (possibly zero) VI instances that are aligned by $Cons$ (depicted as "**X**") are to the left of X': This means that X' induces a violation of $Cons$ in $Cand'$, where it stands between X and the edge but not in $Cand$, where X' is by assumption the rightmost VI instance aligned by $Cons$.[11]

The same holds for the rightmost instance of **X** in (61b), where there are VI instances aligned by Cons on the left of X (and possibly others to the left of X') but not on its right. If there are any further items aligned by $Cons$ to the right of X, then X induces a constraint violation of $Cons$ just as in (60):

[11]Put another way: In $Cand$, X is not present, hence the distance between X and the left edge does not lead to a constraint violation. In $Cand'$ of (62-a), there is at least one VI between X and the left edge, namely X', which leads to the additional violation of alignment.

(61) a. **EDGE** ... **X** ... X' ... X ...

b. **EDGE** ... X' ... **X** ... X ...

c. **EDGE** ... X' ... X ... **X** ...

In all cases $Cand'$ induces the same number of constraint violations as $Cand$ plus one more. Hence $Cand'$ is less optimal than $Cand$.

Since $Cand$ is at least as harmonic as $Cand'$ for all constraints and there is (by assumption) always an alignment constraint for which $Cand'$ is less harmonic, it follows that $Cand'$ is less harmonic under all possible rankings. This result can be generalized to pairs $Cand$ and $Cand^*$, where the latter allows the insertion of an arbitrary number of instances of VIs instantiated in $Cand$. For each such $Cand^*$ there is a sequence $Cand\ Cand'_1 \ldots Cand'_q\ Cand^*$ ($Cand = Cand'_0$) such that $Cand_{i+1}$ is the result of inserting one more instance of a VI into $Cand_i$ which is already instantiated in $Cand_i$. From the transitivity of harmony (i.e. if B is more harmonic than A and $Cand$ is more harmonic than B, then $Cand$ is more harmonic than A), it follows that $Cand^*$ is less harmonic than $Cand$.

Let us turn to a concrete example. For a Georgian input containing [+AGR +3 +pl], GEN licenses an arbitrary number of instances of the 3pl affix -*en*:

(62) *xedav-en, xedav-en-en, xedav-en-en-en, ...*

(63) shows how increasing the number of instances increases the number of constraint violations:

(63)

	NUM ➪ R	L ⇦ PER
xedav-en		*
xedav-en-en	*	**
xedav-en-en-en	**	***
xedav-en-en-en-en	***	****

3.4.4 The Elsewhere Condition

There are many versions of the Elsewhere Condition going back to Kiparsky (1973) who ascribes it to Pāṇini. I will not discuss the different versions here but try to reconstruct its use in the context of classical DM where it is incarnated in two sub-principles:

(64) a. **The Subset Principle:**
"The phonological exponent of a Vocabulary item is inserted ... if the item matches all or a subset of the grammatical features specified in the terminal morpheme. ...

Where several Vocabulary Items meet the conditions for insertion, the item matching the greatest number of features specified in the terminal morpheme must be chosen." (Halle, 1997:428)

b. "… the choice among competing allomorphs is … determined by the Pāṇinian principle … giving precedence to the allomorph appearing in the most complex, most highly specified context over allomorphs appearing in less complex contexts." (Halle and Marantz, 1993:123)

For ease of reference, I will refer to the second constraint as the **Context Principle** and will treat here only its most important subcase, which requires that VIs with context specifications are preferred over otherwise identical VIs, as in (65), where I assume the VIs *n-* $\leftrightarrow$ [+impf] / ___ [+3 +pl] and *i-* $\leftrightarrow$ [+impf]:

(65) a. *v-xedavd-**i**-t,* 'we saw'
S1-see-IMPF-PL

b. *xedavd-**n**-en,* 'they saw'
see-IMPF-S3p

The winning VI can be said here to be more specific since it has a context specification not found in the competitor.

The Subset Principle regards specificity in the content features of VIs. For example in (66) 1pl object agreement can be realized by three affixes: *gv-* [+1 +pl], *m-* [+1] and *-t* [+pl].

(66)	*gv-xedav/*m-xvedav/*xedav-t* O1pl-see/O1s-see/see-PL	'you (sg.) see us'

Again, *gv-* can be said to be preferred: it is more specific in this case because it contains more features than the other two VIs.

In versions of DM that in principle allow the insertion of multiple VIs in single nodes, the Elsewhere Condition (taken together with other mechanisms) has a third typical effect related to the second one: A more specific item also blocks the combination of less specific ones even if the "combination" of these" is as specific as the single item. E.g. *gv-xedav* ([+1 +pl]) also blocks **m-xedav-t* ([+1][+pl]).

Since the notion of insertion into a single node is not available in DO, no direct reconstruction of the Elsewhere Principle is possible. What I will do is to show that the effects ascribed to it follow from the architecture of DO.

Preference for Context Specifications

The preference for VIs with context specifications illustrated in (65) can be formulated as follows:

(67) A candidate $C_1 = V_1 \ldots V_c \ldots V_n$ is always more harmonic than a candidate $C_2 V_1 \ldots V_c' \ldots V_n$, where V_c and V_c' (apart from their Phon value) differ only by their context specifications, which is nonempty for V_c and empty for V_c'.

Proof: Context maximization is the only constraint that refers to context specifications. Hence for all other constraints C_1 and C_2 are equally harmonic. As is easy to see C_2 induces exactly one more constraint violation of Context maximization than C_1 and is therefore less harmonic.

Realization of more specific FSs

Following the considerations above, the effect of the Subset Principle can be decomposed into two parts:

(68) Each input FS

a. is realized by the most specific VI available (V) and
b. is not realized by any VI less specific than V.

Let us start by attempting a rough approximation to (68a). For simplicity, I will restrict myself to simple (i.e. non-portmanteau) VIs, but the same point could also be made including them. Identifying thus each VI with a FS and disregarding the possibility of multiple VIs with the same feature content, (68a) can be derived by assuming that there are only PARSE constraints and that for all FSs subsuming any VI there is a constraint PARSE FS. Again, we compare two candidates that differ minimally in that $Cand$ does not contain an instance of the VI V (the most specific VI licensed by F) coindexed with an input FS F while $Cand'$ does. Following the type of argumentation laid out in 3.4.3 it is easy to see that $Cand'$ satisfies all PARSE constraint that $Cand$ does, hence it is at least as harmonic. By assumption, $Cand$ does not have any VI parsing F in the input F. Given PARSE [F], there is one constraint for which $Cand'$ is more harmonic than $Cand$, hence it is more harmonic under all possible rankings.

While it is plausible that all feature combinations tend to be realized, i.e. that for each feature structure there is a PARSE constraint, it is obviously pointless to derive the realization of more specific FSs under the assumption that apart from PARSE constraints there are no other constraints.

Can we not derive the Elsewhere Principle more generally?

We cannot, for rather trivial reasons. The whole sense of impoverishment and blocking constraints is to reduce complexity by preventing the appearance of specified VIs. Assuming two VIs /a/ [+1 +pl] and /b/ [+1] the Elsewhere Principle would favor /a/, but an impoverishment constraint IMPOVERISH [+1 +pl], ranked higher than the relevant PARSE constraints, would nonetheless block its appearance.[12] Hence all we can say is that the most specific VI is "inserted" as far it concerns PARSE constraints and no constraints blocking it prevents this. But interpreting the Elsewhere Principle as holding between inputs and outputs, something comparable also holds for other morphological frameworks which adopt an explicit version of the Elsewhere Principle. E.g. in Classical DM impoverishment rules prevent the insertion of specific VIs into heads.

Blocking of less Specific VIs

(68-b) is empirically only partially correct. For example in Turkana, [+Nom +2 +pl] is expressed by a prefix specified [+2] and a suffix [+Nom +pl] (Dimmendaal, 1983:121,122):[13]

(69)	a.	*ì-los-e-tè* [+2]-go-ASP-[+Nom+pl]	'you (pl.) go'
	b.	*ì-los-ì* [+2]-go-ASP	'you (sg.) go'

[12] The same holds for other constraint types. Thus L ⇦ [pl] prefers $[+1]_1$ over $[+1]_1[+2\ +pl]_2$.

[13] The plural affix must be marked for case since it marks only the case of *subjects*, while the person marker also realizes *object* person in certain contexts. See 7.3 for discussion.

(68b) would wrongly predict that *i-* in (69a) should be blocked since *-ì* is a more specific VI spelling out the same underlying head (subject agreement). What seems correct about blocking is that affixes that express only a subset of the information of a more specific one are blocked, as was already demonstrated in (66). In (70), the relation between the blocking and the blocked element in this cases is defined more formally:

(70) An (indexed) VI V is informationally included in another VI V' iff for all FSs F in V there is a unique FS F' in V' such that Indexing(F) = Indexing(F') and F subsumes F'.

Blocking of the informationally poorer VI is analogous to the blocking of multiple identical VIs in 3.4.3: It can be shown that adding a VI V to a candidate $Cand$ which already contains a candidate which informationally includes V results in a candidate $Cand'$ that is less harmonic than $Cand$ since $Cand'$ will be less harmonic for some ALIGN constraint and at most as harmonic as $Cand$ for all other constraints. Since the proof is almost identical to that in 3.4.3, I omit it here.

3.4.5 Finiteness of the Output

Inflectional systems assign only a small finite number of forms to each "feature combination", in the extreme only one.[14] Finiteness of the output derives straightforwardly from the preceding results. Recall that I have shown in 3.4.3 that each different VI[15] occurs only once. From this, the corollary in (71) follows:

(71) **Corollary:** For a given ranking and input there is always a finite number of optimal candidates.

This holds because there is only a finite number of VIs and a finite number of input FSs for a form, hence only a finite number of indexed VIs, and each indexed VI according to the proof in 3.4.3 occurs not more than once.[16]

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[14]It is a common misunderstanding of OT that each ranking of an arbitrary constraint set leads to a finite or even unique set of optimal candidates. To see that this is wrong, consider an arbitrary ranking where all constraints are crucial to determining the optimal candidate. Now, remove the constraint that is ranked lowest and what results is a ranking with multiple optimal outputs. MM (Wunderlich and Fabri, 1994:268) make the claim that in morphology there is always only one candidate in the form of a uniqueness constraint. Such a constraint of course is rather pointless if there are no other principles that choose the unique candidate from the candidate set. But if such principles are present in the concrete case, Uniqueness becomes superfluous.

[15]More precisely: each different indexed VI.

[16]This does not mean that outputs cannot be of arbitrary length; but for an input of fixed length, the output will also be of fixed length.

Chapter 4

Controversial Issues in OT Morphology

While there are currently few if any overall accounts of OT-morphology, there are a great number of divergent proposals with regard to the nature of constraints, GEN and the placement of morphology in the architecture of grammar. The aim of this chapter is to defend the specific choices that DO makes in these areas. Section 4.1 argues that feature insertion is unnecessary in OT-morphology, and 4.2 shows that the DO conception of feature realization constraints is preferable to alternative models. In 4.3, evidence is presented that all basic constraint types exist in output-only and input-output versions. The final sections discuss the place of OT-morphology with respect to other components of the grammar. It is argued that the arguments for assuming a global evaluation of constraints from syntax and morphology are not compelling (4.5), but that morphological constraints are evaluated after syntax in a local manner (4.4). Some minor issues, such as feature hierarchies and lexicon optimization, are briefly discussed in 4.6. The general line of argumentation in this chapter is a minimalist one. More complex and unrestricted accounts are rejected if a more minimal one is tenable without loss of adequacy. The only exception is 4.3, where arguments for a rather rich constraint inventory are given.

4.1 Feature Insertion in Spell-Out

As noted in 3.2.4, DO does not know feature insertion. Several writers argue that this should be an option in OT morphology (e.g. Grimshaw, 1997; Gerlach, 1998) or DM (Noyer, 1998). In this section I discuss some examples apparently supporting this claim and show how adequate analyses in DO can be given without feature insertion. In addition to data from Yurok and Romance clitic clusters, neutralization in Nimboran will be of central concern.

4.1.1 Yurok Person Neutralization

The spell-out of lexical items generally results in VIs that subsume the corresponding LIs. This simply follows from the definition of GEN in 3.2.4. There are apparent cases of feature insertion like the following from Yurok, (Robins, 1958) where the singular agreement affixes of verbs are replaced by the "1st singular" affix if an agreement prefix precedes[1] (ibid:34, 51)

(1) **Yurok:** *koˀmoy-*, 'to hear'[2]

Singular			
		without prefixes	**with prefixes**
	1	*koˀmoy-o-**k'***	***(ˀ)ne**-koˀmoy-o-**k'***
	2	*koˀmoy-o-**ˀm***	***k'e**-koˀmoy-o-**k'***
	3	*koˀmo **ˀ**y*	***ˀu** -koˀmoy-o-**k'***
Plural			
	1	*koˀmoy-o-**h***	***(ˀ)ne**-koˀmoy-o-**h***
	2	*koˀmoy-o-**ˀw***	***k'e**-koˀmoy-o-**ˀw***
	3	*koˀmoy-o-**ł***	***ˀu**-koˀmoy-o-**ł***

[1] The use of these prefixes marks a set of further categories apart from agreement. Cf. Robins (1958:53).

[2] All agreement affixes are printed in boldface.

However, we are not forced to analyze *-k'* as a 1sg affix: *-k'* can be seen as a default agreement marker which is inserted in the prefixless 1sg, since there is no better candidate to mark agreement in this case. In the prefixed singular forms it is then added to satisfy a minimum constraint that requires at least one agreement suffix.[3]

4.1.2 Romance Clitic Clusters and DEP Constraints

The analyses of Romance clitic clusters in Grimshaw (1997) and Gerlach (1998) (see also 3.3.4) – if correct – give direct support to morphological OT *with* feature insertion. Since clitic clusters are somewhat out of the scope of this thesis, I will not go into any detail but try to show that there is a plausible analysis without feature insertion.

Replacement of *si* by *ci*

Recall from section 3.3.4 that in Italian the impersonal subject ('one') and the reflexive clitic ('him-/her-self') in isolation both have the form *si*, while the first *si* is replaced by *ci* when the two are combined.

(2) *Ci si lava* 'One washes oneself'
one oneself washes

[3] See 7.4.3 for a fuller analysis.

Grimshaw (1997:12) claims that this *ci* is the 1pl clitic. Gerlach (1998:22-23) however notes that there is a second homophonous *ci*, which she terms locative:[4]

(3)	a.	*ci vado* ci go:1sg	'I go there'
	b.	*ci sono problemi* ci be:3pl problems	'There are problems'
	c.	*ce l' ho* ci it have:1sg	'I have it'

In fact, most uses of *ci* are not even locative, but rather expletive (3b) or emphatic (3c). Thus my proposal is to treat *ci* as the most underspecified clitic, while *si* has a rest of pronominal reference (let us say the feature +person, +animate or +3). This is also supported by the fact that the uses of *ci* seem more widespread than that of *si*, and *si* seems restricted to refer to pronominal arguments. *ci si* instead of **si si* would thus mean a retreat to the unmarked form without feature insertion, and preference of the more specified *si* in mono-clitic contexts is explained straightforwardly by feature parsing requirements.

[4] As can be seen from (3c), the vowel of *ci* is turned into *e* before certain other clitics.

Feature Floating with Spurious *se*

The second case where, according to Grimshaw, feature insertion is crucially involved is feature floating with spurious *se* in Spanish. *Spurious se* is the appearance of *se* (corresponding to Italian *si*) in a clitic-cluster where a 3rd person non-reflexive would be expected (**le lo* → *se-lo*).

(4) a. *El premio,* ***lo*** *dieron a Pedro ayer.*
the prize 3:ACC gave:3pl to Pedro yesterday

b. *A Pedro* ***le*** *dieron el premio ayer.*
to Pedro 3:DAT gave:3pl the prize yesterday

c. *A Pedro, el premio,* ***se lo*** *dieron ayer*
to Pedro the prize se 3:ACC gave:3pl yesterday
(*le lo/*lo le)

'They gave the prize to Pedro yesterday' (Grimshaw, 1997:17)

Now, in some dialects if the clitic replaced by *se* would be plural, the non-realized plural feature is realized on the accusative clitic instead (**les-lo* → *se-lo-s*):

(5) *El libro, a ellos ¿quién* ***se los*** *prestó?*
the book to them who se 3:ACC:pl lent:3sg
'Who lent the book to them?' (Grimshaw, 1997:20)

Note first that this, strictly speaking, is not a case of feature insertion since all features, including the misplaced plural feature, are present in the input. However it contradicts the parsing logic of GEN in DO: *los* cannot subsume Dat 3pl since it is an accusative form. While I cannot go into the details, note that the whole argument depends on assuming that *se-los* contains exactly two VIs. If we assume instead with Harris (1994) that clitics are decomposable into stems, theme vowels and number endings, the structure is *s-e-l-o-s*. Under this analysis – leaving aside the question of how to treat theme vowels (see Trommer, 1999c for some ideas) – every VI parses features of only one input morpheme: The initial and final *s* realize features of the dative argument, while *l*- realizes features of the accusative argument. Note that this analysis also renders the formulation of the constraint blocking **les lo* much more easily since what is forbidden now are not too "similar" but identical items: *l* ... *l*. What is unusual in *s-e-l-o-s* is rather the order of the VIs, namely two VIs referring to the same morpheme (the initial and the final *s*) are not adjacent. But the drifting of plural affixes to the right is a more general phenomenon in other languages as well and even elsewhere in some varieties of Spanish, where the imperative plural suffix can be separated from the verb stem by clitics under certain conditions (see Halle and Marantz, 1994). Indeed, it is to expected under the assumptions in this thesis that number markers should tend to the right (see 6.2).

Hence, if we assume that there is a well-motivated reason for the fact that plural -*s* cannot appear immediately after a clitic stem or after reflexive *s*-*e*-, the only possible point for plural -*s* is after *l*-*o*-. This of course induces violations of COHERENCE requiring the contiguity of VIs referring to the same morpheme, which means that under certain rankings metathesized the plural -*s* at the end of the clitic cluster will be avoided and we get *se*-*lo* instead, which is the case in Iberian Spanish (Grimshaw, 1997:20).

4.1.3 Nimboran: Data and Problem

Noyer (1998), using data from Nimboran (Anceaux, 1965), tries to show that feature insertion is inescapable as a morphological device, arguing against lexicalist models of inflection, especially against the detailed analysis of Nimboran inflection in Inkelas (1993). Harbour (2000) modifies the argument to argue against the resource-based version of DM in Trommer (1999c). Subject agreement is marked in Nimboran by two classes of suffixes: the first class consists of -*maN* -*i* and -*k*, stands relatively close to the stem and marks non-singular number (dual and plural) and 1sg inclusive (12).[5] The second class (-*u*, -*am*, -*um*, -*e*) stands finally in the verb complex and marks gender and person (Noyer, 1998:271). Along with the number specifications, (6) contains the feature specifications Noyer uses to decompose them.

(6) Subject Agreement Affixes (Normal environment)

	SINGULAR [+sg **-pl**]	**DUAL** [**-sg -pl**]	**PLURAL** [**-sg** +**pl**]
1	*. . . u*	*k. . . u*	*i. . . u*
12	*maN. . .ám*	*k. . .ám*	
2	*. . . e*	*k. . . e*	
3 MASC	*. . . am*	*k. . . am*	*i. . . am*
3 FEM/INAN	*. . . um*	*k. . . um*	

In the presence of certain particles, such as the durative affix -*tam*, the distribution of the markers changes:

[5]If the subject corresponds to one first person and one second person, this is formally singular in Nimboran. Hence, any non-singular inclusive implies at least three individuals.

(7) Subject Agreement Affixes (Special environment)

	SINGULAR [+sg -pl]	**DUAL** [-sg -pl]	**PLURAL** [-sg +pl]
1	*...u*	*i...u*	
12	*maN...ám*	*i...ám*	
2	*...e*	*i...e*	
3 MASC	*...am*	*i...am*	
3 FEM/INAN	*...um*	*i...um*	

The basic problem with these data is that both *-i* and *-k* – while the first would be intuitively called a dual and the second a plural marker – can mark plural *and* dual subjects, depending on the environment. We cannot assign the same feature content to both suffixes since this would mean that they have the same distribution. If we assign different features to them, at least one of the two must be specified for plurality (since they share the value [-sg]). If the specification is [+pl], this affix cannot be a candidate for DUAL. If it is [-pl], it is equally impossible for PLURAL. Thus, different feature values for *-i* and *-k* mean that at least one of them would have to be exclusively restricted to DUAL *or* PLURAL. As (6) and (7) show, this would be counter to fact. Thus, under the given feature system and the ban on feature insertion intrinsic to DO, no account for the Nimboran data seems possible, if we do not want to have recourse to multiple VIs for *-i* or *-k*.

A second problem results with the distribution of root allomorphs differing by vowel quality and metathesis. While I will not go into the concrete realization of the stem types, the distribution is as follows:

(8) Root allomorphy

subject number	normally	special case
SINGULAR	A	B
DUAL	B	C
PLURAL	C	C

If B is the default form as argued by Noyer, the feature specification for C must be at least as specific as the one for C. If DUAL has to be changed to PLURAL to get the distribution of C in the special environment, this means consequently feature changing or insertion ([-sg -pl] → [-sg +pl]), both excluded under DO. Note that the status of allomorphy of this type is unresolved in DO so it is somewhat problematic here to state a concrete argument. I will start therefore by giving an analysis in terms of Trommer (1999c) which is more in line with standard DM to show that feature insertion at the relevant level is not necessary to account for the Nimboran data. I will then give a tentative transposition of this analysis into DO.

4.1.4 Noyer's Analysis

Noyer assumes the following VIs for the number affixes:

(9) a. *-i* $\leftrightarrow$ [+pl]
b. *-k* $\leftrightarrow$ [-sg]

While *-i* has precedence over *-k* in all other plural forms, in second person plural forms the impoverishment rule in (10) ensures that *-k* is inserted:

(10) [+pl] $\rightarrow$ Ø/ [+2 -sg __]

In the special environment (which I represent here simply as "F") the rule in (11a) deletes [-pl] which triggers the application of the redundancy rule in (11b):

(11) a. [-pl] $\rightarrow$ Ø/ F
b. [-sg] $\rightarrow$ [+pl]

This has the effect that in the special environment dual forms ([-sg -pl]) become [+pl] and that *-i* is inserted in all non-singular contexts:

(12) [-sg -pl] $\Rightarrow$ [-sg] $\Rightarrow$ [-sg +pl]

A further impoverishment rule deletes sg features in the special environment and prevents (10) from applying:

(13) $[\alpha\text{sg}] \rightarrow \emptyset$

A similar analysis is given for the gender affixes. Note the crucial point that (11-b), even if triggered by impoverishment, is a feature inserting rule.

4.1.5 Dissociation for Redundancy

Note first that even in resource-based accounts of DM there is a level where insertion of features happens, namely the stage of MS which executes insertion of "dissociated morphemes" (Embick, 1998) such as certain voice affixes or agreement. I will argue that Noyer's redundancy rule (Noyer, 1998:275), given in (14), can be equally well interpreted as insertion of a dissociated morpheme, thus obviating the need for feature insertion in spell-out proper:

(14) $[\text{F}] \rightarrow [+\text{pl}][\text{F}]/[\text{-sg}]$ (Insertion)

A second note is in place regarding the cooccurrence of *-i* and *-k*. If the first is +pl and the second -sg we would expect the appearance of both to realize PLURAL ([+pl -sg]). I will assume that in any analysis there is a device that blocks multiple number affixes – either a surface filter combined with feature hierarchies as in Noyer (1992), an impoverishment (= zero VI-insertion) rule such as (15) which deletes all number features in the context of a plural head, or a blocking constraint and parsing priority for [+pl], as is expected in DO.

(15) $[\text{NUM}] \rightarrow \emptyset / \ [+\text{pl}]$, where NUM = $\{\alpha\text{sg}, \alpha\text{pl}\}$

The [+pl] feature structure inserted by (14) triggers the C allomorph in the special case of (8). As in Noyer's account, the special environment also triggers deletion of sg features (Noyer:274, 22a):

(16) $[\alpha\text{sg}] \rightarrow \emptyset / \ [\text{F}]$

The triggering context for A is deleted and the default B inserted. Thus, the root allomorphy is accounted for. In the normal dual forms, the only affix for insertion is -*k* [-sg]. In the first and third persons plural its insertion is bleeded by (17):

(17) $[\text{NUM}] \rightarrow \emptyset / \ [+\text{pl}]$[6]

[6]Note that this rule is intended to apply regardless of whether +pl is present in the same lexeme or in an adjacent one.

Hence only -*i* [+pl] appears. For the second person plurals (17) is itself bleeded by (18) (Noyer:271,14a):

(18) $[+\mathrm{pl}] \rightarrow \emptyset / [+2\ \text{-sg}\ \_\ ]$

Consequently, *k*- appears. The impoverishment rule for gender (Noyer:273, 16a):

(19) $[\alpha\mathrm{masc}] \rightarrow \emptyset / [+\mathrm{pl}\ \text{-sg}\ \_\ ]$

is also ordered before (17) and thus applies in the normal environment: In all 3rd person plurals -*am* is inserted. The rules given so far are summarized in (20)

(20)

a.	[F]	$\rightarrow$	[+pl][F]	/ [-sg]	(11)
b.	[αsg]	$\rightarrow$	Ø	/ [F]	(13)
c.	[+plural]	$\rightarrow$	Ø	/ [+2 -sg _]	(10)
d.	[αmasc]	$\rightarrow$	Ø	/ [+pl -sg _]	(Noyer, 1992:237)
e.	[NUM]	$\rightarrow$	Ø	/ +pl	

Note that all rules except (20e) are identical or correspond closely to Noyer's rules (indicated in parentheses). (20e) is independently needed even in Noyer's account to block insertion of *-k* and *-i* for PLURAL.[7]

Let us now see how these rules also account for the distribution of gender and number markers in the special environment. As in Noyer's account, (20b) deletes the -sg feature necessary for the application of (20d). Hence *-um* is inserted in the 3FEM/INAN PLURAL. (20c) is noncrucially bleeded (in fact the -sg specification in the context might be omitted) and (20e) deletes all number features except the dissociated +pl, which means that in all DUAL and PLURAL forms the number marker is *-i*.

4.1.6 Using a Different Feature System

While Noyer expresses the unmarkedness of PLURAL vs. DUAL as a non-singular category by the (inserting) redundancy rule this can also be captured by means of a feature geometry as developed in Harley (1994). Thus, slightly enriching Harley's representations[8], the number categories of Nimboran can be represented as follows:

[7]This is not the case if fission (multiple insertion of VIs) is treated as the marked case triggered only by special triggers as in Noyer (1992) and Halle (1997), which leads to extra marking/rules for cases where fission applies. Moreover, fission by marked context introduces an extra theoretical device (the fission trigger) while for fission as the default case non-fission can be expressed by instances of independently needed impoverishment.

[8]Harley does not have an explicit sg feature. She represents sg by the lack of a plural feature.

(21) a. SINGULAR: $\begin{array}{c} \text{num} \\ | \\ \text{sg} \end{array}$

b. PLURAL: $\begin{array}{c} \text{num} \\ | \\ \text{pl} \end{array}$

c. DUAL: $\begin{array}{c} \text{num} \\ | \\ \text{pl} \\ | \\ \text{du} \end{array}$

The big advantage of this feature system is that we can now account for the Nimboran data without any feature insertion at all. I will assume the following representations for the number affixes:

(22) a. -*k* $\leftrightarrow$ $\begin{array}{c} \text{num} \\ | \\ \text{pl} \end{array}$

b. -*i* $\leftrightarrow$ num

I will also assume that insertion cannot target embedded features, which means that -*i* cannot be inserted into SINGULAR nodes as long as sg is not deleted. The impoverishment rule (23) will delete all dual features, which leads to non-embedding of pl and insertion of -*k*:

(23) dual $\rightarrow \emptyset$

(24) deletes all dual and plural features in the special contexts, where only num remains and *-i* is inserted:

$$(24) \quad \begin{array}{c} \text{pl} \\ | \\ (\text{du}) \end{array} \rightarrow \emptyset/\text{F}$$

The insertion of *-i* in the 1st and 3rd person plurals is guaranteed by:

(25) pl $\rightarrow$ Ø/ [-2]

Since this does not apply to 2nd person morphemes, for these *-k* is used. (27) shows the derivations for 1du, 2du, 1pl and 2pl forms for normal contexts, (28) for the special environment. In the latter, pl (where still present) is deleted in all persons by (24), which hinders the *-k* also in the 2nd person plural. The deletion of pl also blocks (25) in the expected way.

The following rule is responsible for the neutralization of *-um* to *-am*:

(26) αmasc $\rightarrow$ Ø/ [3 pl __]

The root allomorphy can now be connected to the VIs and features present after vocabulary insertion.

(27) Derivation of dual and plural forms (normal context)

<table>
<tr><th>1 PLURAL</th><th>1 DUAL</th><th>2 PLURAL</th><th>2 DUAL</th><th>RULES/VIs</th></tr>
<tr><td>num +1
|
pl -2</td><td>num
| +1
pl
| -2
du</td><td>num -1
|
pl +2</td><td>num
| -1
pl
| +2
du</td><td></td></tr>
<tr><td>+1
num
-2</td><td>———</td><td>———</td><td>———</td><td>pl → Ø/ [-2]</td></tr>
<tr><td>———</td><td>———</td><td>———</td><td>———</td><td>pl
| → Ø/F
(du)</td></tr>
<tr><td>———</td><td>num +1
|
pl -2</td><td>———</td><td>num -1
|
pl +2</td><td>dual → Ø</td></tr>
<tr><td>———</td><td>-k</td><td>-k</td><td>-k</td><td>-k ↔ num
|
pl</td></tr>
<tr><td>-i</td><td>———</td><td>———</td><td>———</td><td>-i ↔ num</td></tr>
</table>

(28) Derivation of dual and plural forms (special context)

<table>
<tr><th>1 PLURAL</th><th>1 DUAL</th><th>2 PLURAL</th><th>2 DUAL</th><th>RULES/VIs</th></tr>
<tr><td>num
|
pl
+1
-2
F</td><td>num
|
pl
|
du
+1
-2
F</td><td>num
|
pl
-1
+2
F</td><td>num
|
pl
|
du
-1
+2
F</td><td></td></tr>
<tr><td>num
+1
-2
F</td><td>———</td><td>———</td><td>———</td><td>pl → Ø/ [-2]</td></tr>
<tr><td>———</td><td>num
+1
-2
F</td><td>num
-1
+2
F</td><td>num
-1
+2
F</td><td>pl
|
(du)
→ Ø/F</td></tr>
<tr><td>———</td><td>———</td><td>———</td><td>———</td><td>dual → Ø</td></tr>
<tr><td>———</td><td>———</td><td>———</td><td>———</td><td>-k ↔ num
|
pl</td></tr>
<tr><td>-i</td><td>-i</td><td>-i</td><td>-i</td><td>-i ↔ num</td></tr>
</table>

The C form occurs always and only before -*i* ↔ num (29b)[9], the A form only if the form contains an undeleted sg feature. If we assume that sg is deleted in the special environment by the impoverishment

[9]I have not been able to check against concrete data the correct root allomorph for 2nd person plurals in the unmarked case. In my account as well as in that of Noyer and Inkelas (1993) it is predicted that the B allomorph is chosen, which runs counter to the table in (8).

rule in (30), (29a) accounts for its distribution. The B form appears in all other cases (29c):

(29) a. A $\Leftrightarrow$ sg
b. C $\Leftrightarrow$ *-i* $\leftrightarrow$ num
c. B $\Leftrightarrow$ elsewhere

(30) $\begin{array}{c}\text{num}\\ | \\ \text{sg}\end{array} \rightarrow \emptyset/\text{F}$

4.1.7 A DO Account

As already mentioned, an account in DO is very tentative since there is currently no integration of hierarchical feature structure and root allomorphy falls outside the scope of this dissertation. Apart from this, the approach sketched for MDM can be carried over with some modifications to DO. I will assume that the vocabulary items are specified as in the last section with the exception of *-k* for which I assume the simpler representation in (31):

(31) *-k* $\leftrightarrow$ pl

Further, I assume two undominated constraints which block multiple number features and the realization of num and sg:

(32) a. Only 1 Number Affix

b. Do not parse any part of $\begin{array}{c}\text{num}\\ |\\ \text{sg}\end{array}$

PARSE [plural] is ranked higher than PARSE [num][10] which means that num (-*i*) only surfaces where pl is blocked. Blocking of plural in the context of [-2 plural] is obtained by a higher ranked impoverishment constraint where the plural feature in the constraint is meant to be matched if it is not dominated by any other feature (dual):

(33) IMPOVERISH $[+\text{pl}]^{[\text{-2}]} \gg$ PARSE $[+\text{pl}] \gg$ PARSE [num]

Gender is blocked by a further impoverishment constraint prohibiting αmasc for underlying [3 pl αmasc] (IMPOVERISH $[\alpha\text{masc}]^{[3\text{ pl }\alpha\text{masc}]}$), dominating the PARSE constraints for gender.

This much accounts for all cases in the normal environment. The main effect of the special environment is captured by the following complex PARSE constraint, crucially dominating all other relevant constraints (except (32b)):

(34) PARSE [num]/αmasc, F

[10] And there is no VI for dual.

This means that in the special context *-i* will be inserted for all DUAL and PLURAL forms and *-um* in the 3rd PLURAL. The final ranking is :

(35) BLOCK [num] $\gg$ IMPOVERISH $\begin{array}{c}\text{num}\\ |\\ \text{sg}\end{array}$ $\gg$ PARSE [num]/αmasc,F $\gg$ IMPOVERISH $[\text{+pl}]^{[\text{-}2]}$, IMPOVERISH $[\alpha\text{masc}]^{[+3\ \text{pl}\ \alpha\text{masc}]}$ $\gg$ PARSE [gend] $\gg$ PARSE [+pl] $\gg$ PARSE [num]

The tableaus from (36) to (39) show the derivation for the number markers in the 2nd person dual and 1st person plural forms.

(36) **Input:** [+2 -1 $\begin{array}{c}\text{num}\\ |\\ \text{pl}\\ |\\ \text{du}\end{array}$] (2 DUAL, normal environment)

	BLOCK num	PRS num/ masc F	IMP $\text{pl}^{[\text{-}2]}$	PRS pl	PRS num
-i num				*!	
☞ *-k* pl					*
-i num *-k* pl	*!				

(37) **Input:** $[+2\ \text{-}1\ \begin{array}{c}\text{num}\\ | \\ \text{pl}\\ | \\ \text{du}\end{array}]$ **F** (2 DUAL special environment)

	BLOCK num	PRS num/ masc F	IMP pl$^{[-2]}$	PRS pl	PRS num
☞ -*i* num				*	
-*k* pl		*!			*
-*i* num -*k* pl	*!				

For simplicity, only the constraints relevant for dual and plural are depicted. In normal 2nd dual forms (37), -*k* wins over -*i* because PRS pl is ranked above PRS num, but PARSE [num]/αmasc,F forces realization of num in the special environment (38). The derivation of 2nd plural and 1st dual forms is entirely parallel.

In 1st plural forms, IMPOVERISH pl$^{[-2]}$ becomes ”active” (recall that it does not apply to dual inputs) and effects that plural -*k* is also blocked in favor of -*i* in the normal environment:

(38) **Input:** [-2 +1 $\begin{array}{c}\text{num}\\ | \\ \text{pl}\end{array}$] (1 PLURAL, normal environment)

	BLOCK num	PRS num/ masc F	IMP pl[-2]	PRS pl	PRS num
☞ -*i* num				*	
-*k* pl			*!		*
-*i* num -*k* pl	*!				

(39) **Input:** [-2 +1 $\begin{array}{c}\text{num}\\ | \\ \text{pl}\end{array}$] **F** (1 PLURAL special environment)

	BLOCK num	PRS num/ masc F	IMP pl[-2]	PRS pl	PRS num
☞ -*i* num				*	
-*k* pl		*!	*		*
-*i* num -*k* pl	*!				

I will only discuss very informally the root allomorphy. The C allomorph will be assumed to be sensitive to the presence of a num affix while A is triggered by the underlying feature sg. A type of impoverishment will prohibit the realization of sg even in terms of morphonological allomorphy in the context of F and thus give rise to the choice of default B instead of A in the singular.

4.2 The Proper Treatment of Parsing and Correspondence

Readers familiar with the literature on Correspondence Theory (CT) in OT will have noted that the design of constraints requiring feature realization in DO departs in crucial respects from the one normally employed in current OT-work on phonology. In this section, I will motivate the structure of DOs PARSE Constraints against an architecture as in Gerlach (1998) that is closer to standard CT on the one hand and an alternative model which involves double coindexing (Grimshaw, 1997, 2001; Wunderlich, 2000a,b).

4.2.1 Phonological Correspondence Theory

In the earliest work on OT phonology (Prince and Smolensky, 1993), faithfulness was checked entirely on the surface where "deleted" segments were present, but marked diacritically as deleted by enclosing them in brackets ("$<, >$"). For concreteness let us take a hypothetical language in which underlying CVC sequences are turned into CV by a constraint penalizing codas:

(40) **Input:** bab

	NoCoda	PARSE
☞ ba<b>		*
bab	*!	

There is no explicit notion of correspondence here, the relation between b and <b> in the output is guaranteed only by the working of GEN which basically preserves the input in the output. That the first candidate violates PARSE is clear from the "surface form" through the brackets.

In McCarthy and Prince (1995), this approach is replaced by a model where correspondence is represented by coindexing between input and output units. Thus for our example we get:

(41) **Input:** $b_1a_2b_3$

	NoCoda	DEP	MAX
☞ b_1a_2			*
$b_1a_2b_3$	*!		
$b_1a_2b_3a_4$		*!	

The first candidate again violates a faithfulness constraint which now is called MAX and requires that each underlying index has at least one corresponding surface index. Crucially this is now a two-level constraint which has to check the relation of input and output, while the PARSE constraint of (40) could assign violation marks on the base of output representations only. A second faithfulness constraint DEP requires that no element is introduced that corresponds to nothing in the input. An example is a_4 in the third candidate. The correspondence model has two advantages: First, it can be extended to serve as a natural account for reduplication facts (McCarthy and Prince, 1995) and second, it allows to formulate constraints between corresponding input and output segments. The details of reduplication are not relevant for our discussion, but constraints on the relation between corresponding input/output elements lie at the heart of feature realization constraints in OT-morphology. For phonology, McCarthy and Prince (1995) propose most prominently the class of identity constraints. To remain in our hypothetical language nothing up to this point prohibits that an output sound differs in an arbitrary way from its corresponding input sound. Indeed a certain degree of difference might be required by phonological constraints, but of course only as far as necessary. Thus imagine that codas in our language are allowed, but obstruent coda consonants are required to be voiceless by a constraint *VoicdCoda:

(42) **Input:** $b_1a_2b_3$

	*VoicdCoda	Ident(Voic)	Ident(Place)
☞ $b_1a_2p_3$		*	
$b_1a_2b_3$	*!		
$b_1a_2t_3$		*	*!
$b_1a_2d_3$	*!		*

The Ident constraints now require for certain features that corresponding elements (i.e., which bear the same index) are identical in feature values.

4.2.2 Standard Correspondence in Morphology

Translating the phonological model to OT morphology advocated most clearly in Gerlach (1998), one naturally equates morphemes with segments, and this works fine for cases where there is a 1:1 relation between abstract heads and affixes. There are two objections that can be raised against this approach. *First*, the use of DEP constraints implies that there are "inserted affixes", i.e. affixes with no correspondent in the input. But while segment epenthesis in phonology is common, a corresponding phenomenon in morphology hardly seems to exist.[11] In

[11]See Trommer (1999c) for a discussion of Indo-European theme vowels which are sometimes claimed to involve affix insertion.

DO therefore only VIs corresponding to input FSs are licensed.

Second, problems arise when we deal with discontinuous bleeding as in Noyer (1992), where single heads are expressed by multiple affixes. Recall for example that in Georgian 1pl subjects are expressed by a prefix expressing the feature 1 (*v*-) and a suffix expressing +pl (-*t*).

In the naive adaptation of Correspondence Theory however, the correct realization for 1pl will always be suboptimal to forms where only one of the two affixes appears:

(43) **Input:** $[+1\ +pl]_1$

	MAX	Ident(+pl)	Ident(+1)
$v[+1]_1$ V $t[+pl]_1$		*!	*
☞ $v[+1]_1$ V		*	
☞ V $t[+pl]_1$			*
V	*!	*	

The reason is that each of the VIs is coindexed with $[+1\ +pl]_1$. v[+1] differs from it in +pl, where it is not specified and t[+pl] for the analogue reason in +1. But each difference in the feature content of an underlying head and one of its correspondents induces a violation of the relevant Ident constraint. Since MAX is already satisfied by one correspondent, additional affixes just make the situation worse. The situation gets somewhat less absurd if one does not count underspecification of F in the output FS as a violation of Ident(F), which however means that all candidates in (43) are of equal quality, since none shows any violations of MAX or Ident. By the existence of independent economy principles one should again expect a preference for realizations with only one affix.

4.2.3 Parsing without Correspondence

Noyer (1993b) and Trommer (1999a) propose realization constraints that work without correspondence. The proposal in Trommer (1999a) makes crucial use of PARSE constraints. These differ from the PARSE constraints in this thesis in that they work without correspondence. The subsumption requirement for corresponding feature structures, in DO a prerequisite for coindexing, is simply part of the definition of feature parsing. (44a) shows the definition of parsing from Trommer (1999a:146), (44b) repeats the version stated in (10).

(44) a. A feature structure FS_{output} parses a feature structure FS_{anchor} in a feature structure FS_{input} if and only if FS_{anchor} subsumes FS_{output}, FS_{output} subsumes FS_{input} and all feature value pairs that are specified in FS_{anchor} are specified in

FS_{output}

b. A feature structure FS_{output} parses a feature structure FS_{anchor} in a feature structure FS_{input} if and only FS_{output} and FS_{input} are coindexed and FS_{anchor} subsumes FS_{output}

(44a) works fine for most cases of feature realization since normally even in languages with complex inflectional morphology there are few VIs that can parse features of more than one input head.[12]

Where affixes can realize features of several heads, as do plural affixes that realize object and subject number, this predicts that these should coalesce as in Georgian, i.e. there should be only one number affix per word:

(45) a. *xedav-t* 'I see you (pl)'
see-PL

b. *v-xedav-t* 'we see you (sg.)'
S1-see-PL

c. *v-xedav-t, *v-xedav-t-t* 'we see you (pl)'
S1-see-PL

This is expected since in a correspondence-less theory nothing hinders one affix from realizing features of two heads and all constraints

[12]One reason for this is the general avoidance of agreement with two heads that are identical in person, such as in **I see me*, as predicted by Binding Theory (Chomsky, 1981).

favoring economy will tend to block multiple instances of the same affix. Since coalescence of subject- and object-number seems to hold in virtually all languages where there are number markers, such as in Georgian[13], this is also evidence for the correspondence-less account. Apart from this, it also makes the right prediction for discontinuous bleeding. (46) shows how the appearance of the correct affixes in Georgian *v-xedav-t* can be derived without correspondence:

(46) **Input:** [+1 +pl]

	PARSE(+1)	PARSE(+pl)
☞ v[+1] V t[+pl]		
v[+1] V		*!
t[+pl] V	*!	
V	*!	*

The general problem with correspondence-less parsing is that it does not allow a straightforward formulation of certain input-output constraints. In particular, there are cases where identical affixes do appear.

[13]Also in Menominee, Axininca Campa and Kiwai and Ancash Quechua. An apparent exception is one variety of Cuzco Quechua (Lakämper and Wunderlich, 1998:135), where the plural markers -*chis* and -*ku* cooccur. If -*chis*, which always expresses 2nd person arguments, has the features [+2 +pl], this can be said to follow from PARSE constraints. As expected, double occurrence of -*ku* is excluded in this language.

For example in Chichewa (Stump, 1993b; Ortmann, 1999), certain adjectives have two prefixes, both showing agreement in noun-class with the head noun of the noun phrase. The numbers (4, 16, etc.) in the following glosses stand for the Chichewa noun classes involved.

(47) *mi-sika ya-i-kulu*
4-market 4-4-large
'large markets' (Ortmann, 1999:83)

The first class (the "qualifying affixes") is analyzed by Ortmann as a class of derivational affixes used to "qualify" defective roots as adjectives while the members of the second class (the "concordial" affixes), which occur closer to the stem, seem to be genuine agreement affixes. Now in many cases, the form of the qualifying and of the concordial affixes coincides, and we get sequences of identical prefixes:

(48) *pa-sukulu pa-pa-kulu*
16-school 16-16-large
'at a large school' (Ortmann, 1999:82)

If these are really the same affixes[14], it is impossible to get the realization of both in an OT version without coindexing, since all features realized by two affixes would also be realized by one, and other

[14]Ortmann assumes homophonous affixes in these cases.

constraints like alignment generally conspire against double affixes (see 3.4.3). In DO we can assume that there are two agreement heads($[+16]_1$ and $[+16]_3$ in (49)) one attached to the stem and one to the derivational head ($[+D]_2$), which is itself not realized:

(49) **Input:** $[+16]_1$ $[+D]_2$ $[+16]_3$ Stem_4

	PARSE(+16)	FIDELITY
☞ pa$[+16]_1$ pa$[+16]_3$ Stem_4		
pa$[+16]_1$ Stem_4	*!	
pa$[+16]_3$ Stem_4	*!	
pa$[+16]_{1,3}$ Stem_4		*!

Note that there are two points where reference to indices is crucial: The constraint FIDELITY (see 3.3.4)[15], which blocks the realization with only one prefix and mixed indices, and the definition of Parsing by coindexing. Using the definition of feature parsing from Trommer (1999a) ((44)a.), the prefixes in pa$[+16]_1$ Stem_4 and pa$[+16]_3$ Stem_4 would both parse both agreement heads and thus be equally optimal to the affix-repetition candidate. On the other hand, the use of FIDELITY also allows us to express the fact that pure number markers usually coalesce. If the constraint in (49) is FIDELITY(per) (or FI-

[15]The Nahuatl case presented there of course offers the same type of argument in favor of indices.

DELITY(noun class)) and there is no constraint FIDELITY(num), this would predict general coalescence for number affixes.

4.2.4 Double Correspondence Approaches

The DO concept of feature parsing thus avoids the disadvantages of both naive correspondence and of approaches without correspondence. There is however a third approach to feature realization which I will call *double correspondence* because it involves correspondence of feature structures *and* of single features (Grimshaw, 1997, 2001; Bresnan, 2001a, 1999; Wunderlich, 2000a,b).[16]

The basic idea is that the constraint type MAX is extended to cover features (or feature value pairs). Thus for our Georgian case we can assume the constraints MAX(+pl) and MAX(+1), which means that +1 in the input should correspond to something with the same index in the output:[17]

[16]While none of these proposals is formally very clear, it is obvious that what is meant is the coindexation of features since these authors make use of MAX constraints which to my knowledge are always defined in terms of indices.

[17]To avoid confusion, indices of features will be notated by letters not by numbers.

(50) **Input:** $[+1_A\ +pl_B]_1$

	MAX(+pl)	MAX(+1)	Id(+pl)	Id(+1)
☞ $v[+1_A]\ t[+pl_B]_1$				
$v[+1_A]_1$	*!			
$t[+pl_B]_1$		*!		
$v[+1_B]\ t[+pl_A]_1$			*!	*

This functions similarly to PARSE constraints in DO, the difference being that much more technical apparatus is needed here to achieve the same result. Thus, the resources involved in parsing are:

- Double Coindexation
- DEP Constraints
- Identity Constraints
- Three types of MAX constraints
  - MAX(FS) for feature structures
  - MAX(F) for single feature s
  - combined MAX(F_1,F_2) for pairs of features[18]

[18]This is the version found in Wunderlich (2000a). Bresnan (2001a, 1999) uses the notation FAITH$^{F_1\&F_2}$..

As discussed above in 4.2.2, DEP constraints are unnecessary. Identity constraints are also unnecessary, if GEN does not allow feature insertion in the first place, as is the case in DO. The logical consequence of double correspondence approaches is that there are two kinds of identity constraints, one for features and one for feature structures. The second seems to be an artifact of the theory since the use of non-identical coindexed features is rather questionable. Now, the core of feature realization in these approaches is the MAX family, which seems to have the advantage that it incorporates a more general concept than parsing constraints. Indeed this is also an artifact of the theory. Thus, once feature insertion is abandoned there is no use for MAX(FS), since realization of feature structures will always already be forced by MAX(F) with the exception of morphosyntactically empty affixes.[19] There are very few known examples of such affixes and most can be argued to specify at least generic features like +AGR.[20] The two remaining types of MAX constraints, MAX(F) and MAX(F_1,F_2), are also unnecessary in DO since they are replaced by PARSE constraints

[19]In phonology MAX(FS) is used to capture the fact that input segments must be realized by segments in the output even though the features of the corresponding segments diverge. My claim here is that output FSs in morphological spellout are never distinct from the corresponding input structures, and thus there is no motivation for MAX(FS).

[20]Some cases of (almost) empty affixes are required by surface constraints such as the Yurok AGR suffix (4.1.1) or the empty comparative stem in English (4.5).

which already allow the reference to feature structures, i.e. to sets of features. Consequently, double indexing is also unnecessary in DO since no constraints refer to the indices of features. Taken together, coindexation of FSs is indispensable but coindexation of features is dispensable. Thus, the DO version of feature realization, at least as morphology is concerned, is preferable with respect to theoretical parsimonity.

4.3 The Need for Input-Output Constraints

Much of the appeal of early OT (Prince and Smolensky, 1993) was due to the fact that all constraints applied "on the surface". Even in Correspondence Theory, most constraints apart from faithfulness constraints remain output constraints. The aim of this section is to show that all central constraint types in OT morphology must exist in output-only but also in input-output versions to achieve descriptive adequacy. This means that OT-morphology in crucial respects should be a two-level formalism.

4.3.1 Why we need Two-Level Alignment

Problems with surface alignment arise whenever morpheme order depends on featural content neutralized in the surface VIs. One such case are the pronominal clitics of Modern Greek (Gerlach, 1998:14). (51) shows the paradigm of simple clitics:[21]

(51) Modern Greek Pronominal Clitics

<table>
<tr><th></th><th colspan="2">singular</th><th colspan="2">plural</th></tr>
<tr><th></th><th>acc</th><th>dat</th><th>acc</th><th>dat</th></tr>
<tr><td>1</td><td>me</td><td>mu</td><td colspan="2">mas</td></tr>
<tr><td>2</td><td>se</td><td>su</td><td colspan="2">sus</td></tr>
<tr><td>3m</td><td>ton</td><td rowspan="2">tu</td><td colspan="2">tus</td></tr>
<tr><td>3n</td><td>to</td><td>ta</td><td rowspan="2"></td></tr>
<tr><td>3f</td><td>ti(n)</td><td>tis</td><td>tes</td></tr>
</table>

The natural analysis for *tus* is that of a 3rd person plural marker ([+3 +pl]) unspecified for case and gender, which surfaces if the more specific markers *ta* ([+3 +n +Acc +pl]) and *tes* ([+3 +f +Acc +pl]) are not licensed. But Gerlach assumes that the order of 3rd person clitics is determined by the constraint ALIGN(Left, dat), which does

[21]Modern Greek no longer distinguishes dative (dat) and genitive. The forms labeled here dative are labeled genitive by Gerlach (1998).

not account for the orderings in (52) if *tus* is unspecified for case:

(52)	a.	*tus* *ton* O3p ACC:3s	'to them him' (acc.)
	b.	*tu* *tus* DAT:3s O3p	'to him them' (acc.)

This problem is solved in Gerlach (1998:14) by the assumption that *tus* in (52a) is [+pl +dat] and *tus* in (52b) [+pl +Acc +mas]. Introducing this kind of arbitrary homophony can be avoided if certain alignment constraints refer to the underlying content of heads. Thus the DO constraint in (53) requires that clitics which *correspond* to an underlying dative FS are aligned to the left, which also captures the case in (52):

(53) L ⇦ $[+\mathrm{cl}]^{[+\mathrm{dat}]}$

A similar point can be made regarding agreement in Classical Ainu (Shibatani, 1990:26f.). The second person singular affix *e-* is used for marking subject *and* object agreement, while 1st person sg agreement has specific markers for transitive subject (*a-*) and object (*i-*). In combination, *e-* precedes *i-* but follows *a-*:

(54) a. *a-e-kore* 'I give you'
S1s-2sg-give

b. *e-i-kore* 'you give me/us'
2sg-O1-give

Again, the simplest analysis is to stipulate two-level-alignment. For example L ⇦ $[+\text{AGR}]^{[+\text{Nom}]}$ accounts for the data. While Greek clitics as well as the data from Classical Ainu do lend support to two-level alignment, it is not the strongest support that is conceivable. In fact, we might escape the assumption of two-level alignment through additional surface constraints. In particular, we might assume that there is a constraint aligning Accusative to the right edge in Modern Greek, and object affixes to the right and subject affixes to the left in Ainu. Since for independent reasons[22] in both cases there is always at least one case-marked VI in VI combinations, this suffices for fixing the order.

Stronger evidence comes from cases where a VI – depending on its use – sometimes precedes and sometimes follows another VI. Consider for example the Italian reflexive clitic which can be used to express reflexivity but also an impersonal subject:

[22]In Modern Greek clitic clusters, we could in principle expect *mas tus*, 'to us them' and *tus mas*, 'to them us', but only the first is well-formed, because [-3] clitics always appear at the left edge of the cluster (see 4.5 for further discussion).

(55) a. *si dorme* 'one sleeps'
si sleep:3sg

b. *si lava* 'he washes himself'
si wash:3sg

In both uses, *si* can be combined with 3rd person accusative clitics, but when *si* expresses an impersonal subject it follows object clitics, while if used for expressing reflexivity it precedes them:[23]

(56) a. *lo* ***si*** *compra* 'one buys it'
it si buy:3sg

b. ***se*** *lo compra* 'he buys it for himself'
si it buy:3sg

This forces Grimshaw (2001), who assumes that all alignment constraints refer to surface features, to stipulate two different VIs, *si*$_1$ and *si*$_2$, while Grimshaw (1997), in the tradition of Manzini (1986) and Hyams (1986), analyses *si* as one (underspecified) VI. The only reason for assuming two VIs here seems to be that the reflexive *si* has different positional properties from the *si* used impersonally. On the other hand, the minimalist assumption that only one VI *si* exists can be maintained in a two-level theory of alignment, where (underlying) reflexives can be subject to other constraints than (underlying) impersonals.

[23]*Se* is a morphophonologically conditioned alternate of *si*.

While it is difficult to see how in this case arbitrary homophony can be avoided, even stronger evidence for two-level alignment comes from cases where two agreement affixes which are unmarked for case are positioned according to the grammatical roles they mark. Hence, they can appear in different orders when combined with one another. An example that has already been mentioned in chapter 1 are the agreement prefixes of Swahili, repeated here (Stump, 1992:217):

(57) a. *ni-wa-penda* 'I like them'
1sg-3pl-like

b. *wa-ni-penda* 'they like me'
3pl-1sg-like

If alignment applies on the surface, these data remain a mystery. The same argument of course can be made with any language that expresses subject and object agreement (partially) by the same affixes differing only in position, such as Abkhaz (Hewitt, 1989:56) or Macushi (Abbott, 1991).

But surface constraints can be insufficient even in inflectional systems where, crucially, affix order seems to disregard the distinction between subject and object agreement. For example in Wardaman, as will be pointed out more in detail in chapter 6, 1st person affixes always precede 2nd person affixes. Consider the following examples

(Merlan, 1994:127):

(58) a. *nga-n-nu-*. . . 'you (nsg.). . . me '
1sg-ACC-2Nsg-

b. *nga-nu-n-*. . . 'I . . . you (nsg.)'
1sg-2Nsg-ACC-

While the order of person affixes can be modeled without recourse to the underlying structure, that of the accusative affix *n-* cannot: It always follows the affix corresponding to the underlying accusative category. Since this is invisible on the surface, reference to the abstract underlying representation is again unavoidable.

4.3.2 Why we need Surface-Alignment

Striving for a restrictive theory of grammar, we might now be tempted to conclude that two-level-alignment, if necessary, might also be *sufficient* to account for all cases of affix order. So surface alignment would be unnecessary. However, there are also good arguments for surface alignment. For example, Grimshaw (2001) convincingly argues that the "template" for Italian clitics in (59) can be captured best by the minimal constraint Ranking ACCRt $\gg$ PERSLFT (i.e. Align accusative clitics to the right $\gg$ Align person clitics to the left):

(59) Clitic Positions in Italian

A	B	C
1,2	*si*	3-acc
dative		

Since *si* and the first person clitics are unmarked for case, this accounts for the fact that all clitics which are non-third person, dative or reflexive appear on the left. Because all clitics in column A specify a person feature, while *si* does not, the latter appears after 1,2 and dative clitics. As Grimshaw notes, a main advantage of the constraint-based analysis over a template account is that it only refers to natural classes, while column A in (59) clearly does not. On the other hand, this analysis only works if constraints apply on the surface, since the 1st and 2nd person clitics when used for expressing accusative arguments are also underlyingly accusative and should surface on the right of reflexive *si*. Furthermore, the underlying head for *si* is marked for person and would compete for the leftmost position with the clitics of column A if the constraints were to be interpreted in a two-level manner.[24]

[24]Of course, these surface constraints have to be augmented by a two-level constraint L $\Leftarrow$ $[+\mathrm{cl}]^{[+\mathrm{Impersonal}]}$, which ensures that *si* in impersonal use surfaces after all other clitics, i.e. position D of (59). See section 4.3.1.

A second case for surface constraints is the different behavior of person and number affixes even if both refer to the same underlying head. Thus in Georgian, person agreement of subjects (*v-* in (60a)) is expressed by prefixes while number (*-t* in (60a)) and combined person-number agreement (*-en* in (60b))is expressed by suffixes:

(60) a. *v-xedav-t* 'we see'
S1-see-PL

b. *xedav-en* 'they see'
see-S3p

This can be expressed in DO by the surface alignment constraints in (61):

(61) [NUM] ➪ R ≫ L ⇦ [PER].

Again, this analysis is impossible if it operates on the underlying head because underlying heads are all marked for person *and* number, and the special behavior of *v-* would remain unexplained.

4.3.3 Why we need Impoverishment

Also constraints that prohibit realization of features often have to make reference to underlying features that do not surface.

Colloquial Ainu

Let us first look at Colloquial Ainu (Shibatani, 1990). In this language subject and object agreement is marked transparently by prefixes:

(62) *eci-un-kore* 'You give us'
2pl-O1p-give

However in all cases, where the subject is 1st person and the object 2nd person only the 2pl marker *eci* appears (63). The left column contains the compositional forms that would be expected (*ku*-, S1sg; *ci*-, S1pl; *e*-, 2sg).

(63)

**ku-e-*	'I-you (sg.)'		
**ku-eci-*	'I-you (pl.)'		
		$\Rightarrow$	*eci-*
**ci-e-*	'we-you (sg.)'		
**ci-eci-*	'we-you (pl.)'		

While the cooccurrence of 1st person subjects and second person objects can probably be blocked by a surface filter, there is a second neutralization process here that cannot. I will assume that *eci-* is the default second person affix. In contrast to the [+2 +sg] affix *e*-, which marks 2sg objects and subjects in all other cases, *eci-* fails to parse the feature +sg. Thus *e-* would be expected to parse the number feature.

But no surface constraint can block -*e* in the context of an otherwise bare stem, since there is a form where it appears in exactly this context:

(64)	a.	*e-kore* 2sg-give	'you give (intrans.)'
	b.	**e/eci-kore* 2sg-/2-give	'I give you'

Here we have to conclude that the underlying constellation 1st → 2nd person blocks +sg in a 2nd person affix, a kind of two-level constraint, as is familiar from DM impoverishment. The only alternative would be to assume a zero VI. This of course is a highly undesirable step,as DO otherwise has no necessity of zero items.

Nocte

In Nocte negative forms, the following suffixes are used for intransitive subject agreement (Gupta, 1971:16):[25]

[25]Probably, -*m* is segmentable as a negation affix, but this does not affect the following discussion.

(65) Nocte Negative Forms

	sg	**pl**
1	*mak*	*mi*
2	*mo*	*mat*
3	*ma*	*ma*

Object agreement is achieved by suffixes following the subject affixes (66a). If the subject is first person and the object 2pl, subject marking is impoverished and is realized as the default marker *ma* (66c). Again, this cannot be accounted for by a surface constraint since in these forms there is no overt realization of a 2nd person plural object. This leads us to a second phenomenon in Nocte supporting the need for two-level impoverishment: There is no marking of 2nd person objects if the subject is in the 1st person (66b,c)

(66) a. *ma-ho* 3sg/pl:2sg
ma-han 3sg/pl:2pl

b. *mi(*-ho)* 1sg:2sg

mi(-ho)* 1pl:2sg

c. *ma(*-han)* 1sg:2pl

ma(-han)* 1pl:2pl

The object affixes cannot be blocked by *ma* since then blocking would also obtain for the 3rd person subject forms (66a). Homonymy avoidance is an implausible account since the neutralized forms are homonymous with intransitive forms and there are no homonyms for **mi-ho* and **mi-han*. Hence, the process enhances homonymy instead of reducing it.

One technical possibility to escape impoverishment in this case would be to claim that the object affixes are in effect portmanteaus restricted by their features to [-1] subjects. However, this is implausible since such portmanteaus generally precede simple agreement affixes (see chapter 6), but would follow them here. This also would treat the fact that 2nd person object affixes are generally disallowed in the context of 1st person suffixes merely as an "accident" induced by two lexical items, while the impoverishment analysis straightforwardly captures this fact. As is obvious from (66b,c), Nocte also exhibits a number neutralization analogous to the one we observed in Colloquial

Ainu, which provides additional evidence for impoverishment.

Menominee

Menominee shows further evidence for impoverishment. In forms without a third person argument, there is normally an affix *-m* marking [-3]:

(67) *ke-na·tom-enenϵ-m-enaw*
2-call-D-[-3]-1pl
'we call you (sg./pl.)' (p. 157)

However, if the subject is 1sg and the object is 2sg, no *-m* appears:

(68) *ke-na·tom-enenϵ* 'I call you (sg.)' (p. 157)
2-call-D

That there is no overt singular marker here can be seen from the fact that the affixes in (68) are a subset of those in (67). Thus, there is no overt affix that could cause the blocking of *-m* in (68) since it would then also block *-m* in (67). Hence, the constraint suppressing *-m* must refer to the underlying heads, in other words, it must be an impoverishment constraint.

4.3.4 Why we need Surface Filters

Again, we are faced with the question of whether impoverishment does not make the concept of surface filters superfluous. One extensive argument for surface filters was already given in section 2.2.5. Here, one more case will be discussed.

Menominee Plural Blocking

In Menominee there are three affixes for plural marking, -*enaw* [+1 pl], -*waw* [-1 +pl][26] and -*ak* [+3 +pl]:

(69)	a.	*ne-po·se-m-enaw* 1-embark-[-3]-1pl	'we (exc.) embark'
	b.	*ke-pu·se-m-waw* 2-embark-[-3]-2pl	'ye embark'
	c.	*po·se-w-ak* embark-[-3]-3pl	'they embark' (p. 150)

While -*enaw* and -*waw* are both compatible with -*ak*, -*enaw* blocks -*waw* when both affixes would be expected:

[26] See below for arguments why -*waw* is characterized [-1] and not [+2].

(70) a. *ne-na·n-ek-w-enaw-ak (nena·nekonawak)*
1-fetch-D-[+3]-1pl-3pl
'they fetch us (exc.)' (p. 154)

b. *ke-nε·w-e-m-enaw(*-waw)*
2-see-D-[-3]-1pl(*-[-1+pl])
'you (pl.) see us (exc.)' (p. 156)

This could be described in terms of an impoverishment constraint or a surface filter. However, in negated forms, plurality of 3rd person arguments is also expressed by -*waw* (-*owa·w*, (71b))[27] which is again blocked by -*enaw* (-*i·naw*):

(71) a. *ke-po·se-n-o·waw-an*
2-embark-[+per]-[-1+pl]-NEG
'ye do not embark' (p. 168)

b. *o-po·se-n-owa·w-an*
3-embark-[+per]-[-1+pl]-NEG
'they do not embark' (p. 168)

c. *o-na·tom-eko-n-i·naw-an*
3-call-D-[+per]-[+1+pl]-NEG
'they do not call us (exc.)' (p. 170)

[27] This is the reason for assigning -*waw* the value [-1] and not [+2].

This is unexpected under the impoverishment analysis since "underlyingly" 3pl, and 1pl are compatible ((70a)) but natural if we assume a surface filter that blocks multiple [α1 +pl] VIs. Moreover a surface filter also captures the fact that no multiple occurrences of -*waw* are found with 3pl/2pl forms:

(72) *ke-na·tom-eko-n-o·waw-an*
2-call-D-[+per]-[-1+pl]-NEG
'they do not call you (pl.)' (p. 170)

The surface-filter approach is further supported by the fact that -*waw*, when expressing plurality of 3rd person arguments, is again compatible with 1pl arguments if the plurality of the latter is expressed by a different VI, as in conjunct order forms[28], where the plural feature of 1st and 2nd person arguments is marked by -*k* [-3 +pl]:

(73) *na·tum-en-a·h-k-uaq*
fetch-D-[+3]-[-3+pl]-[-1 +pl]
'they fetch us (inc.)' (p. 183)

It might be the case that the blocking of number affixes can be captured by different impoverishment constraints for negated independent and conjunct forms, but this would clearly miss the basic generalization

[28]See chapter 7.

that can be captured by a surface filter. Thus, we are lead to the conclusion that, in addition to impoverishment constraints, surface blocking should also be an option.

4.4 Late Insertion

There are many arguments for late insertion that are largely independent of OT-morphology per se. Part of them has been discussed in section 2.2.3. The most important point in favor of late insertion is affix order, which will be discussed in chapters 5 and 6. Here, I will treat an argument which is more narrowly tied to OT-morphology, namely the problem lexicalist approaches face with hard restrictions on morpheme combination. A case in point are pronominal clitic clusters[29].

In Modern Greek and most Romance varieties, it is not possible to make a statement where both arguments of a ditransitive verb are 1st or second person by expressing the accusative and the dative argument as clitics. This is called the Person Constraint (PC) by Bonet (1991). It is illustrated by the following data from Standard Italian. Note that the pronominals following the verb are full pronominals the ones preceding it are clitics.

[29] A similar case seems to exist in Yimas pronominal prefix clusters (Foley, 1991:200), which are discussed by Wunderlich (2000b) along roughly the same lines as Gerlach's analysis of clitic clusters.

(74) a. *mi mostra a te* ‘(s)he shows me to you’
me shows to you

b. *ti mostra me* ‘(s)he shows me (to) you ’
you shows me

c. *mi ti mostra/*ti mi mostra

Gerlach (1998:19) tries to capture this fact by assuming two constraints Align-L(+1,CS) and Align-L(+2, CS)[30], which are not ranked w.r.t each other. Since both constraints dominate the relevant faithfulness constraints, and appearance of both clitics leads always to the violation of one of the alignment constraints, the optimal output retains only one of the clitics, *ti* or *mi*. Taken seriously, this would imply that the following sentences are synonymous to (74a,b), which they are not:

(75) a. *mi mostra*

b. *ti mostra*

There are two ways to go here: The first possibility is to assume that the input for the spell-out of these clitic clusters comes from the syntax, and that syntactic principles block combinations of this type before spell-out starts. This proposal gets independent support by the fact that there is a well-worked out account of the PC-constraint by

[30]I.e. Align 1st person (and second person) clitics to the left of CS (clitic structure).

Anagnostopoulou (2001) which is purely syntactic. While I do not have the space here to treat this proposal in any detail it is also preferable in that it relates this constraint to a much wider range of facts as e.g. case restrictions on quirky case in Icelandic. The second way out is to claim that **mi ti mostra* and *mi mostra a te* are both candidates in a morphosyntactic OT-grammar, where (74a.,b) outrank (74c) since the relevant alignment constraints are irrelevant for full pronouns. This type of global constraint evaluation comprising morphology and syntax is advocated by Bresnan (2001a) and Grimshaw (2001) and will be criticized in detail in section 4.5.

4.5 Global vs. Local Optimality

In section 4.4, it was noted that certain problems with lexicalist accounts of optimality can be circumvented through global constraint evaluation. By "global" I mean that the structure and form of words are evaluated by the same global system[31] as the structure of syntactic expressions such as sentences and phrases. I will discuss this point focusing on the data from English negation in (76) (Bresnan, 2001a)

[31]A third type of system is discussed in Russel (1999). Russel assumes three modules of the grammar: syntax, phonology and semantics. The representations of each module are optimized w.r.t corresponding expressions of the other ones. While the paper is rather drafty, virtually the same type of globality seems to be allowed as in the global optimality approaches discussed here.

where the ungrammaticality of (76b) vs. (76a) seems to be due to a morphophonological constraint against the form **amn't*.

(76) a. *Isn't he leaving?*

b. **Amn't I leaving?*

c. *Aren't I leaving?*

d. *Am I not leaving?*

In the literature, there are two main approaches to these data: Marantz (1999) proposes that conflicting morphophonological constraints can lead to Ineffability. This means that there would be no output for the input that corresponds to (76b). In contrast, Bresnan (2001a) assumes that the sentence is blocked by more optimal sentences such as (76c) or (76d). To make this account work, (76b) and (76c)/(76d) must be evaluated against each other. This evaluation involves syntactic constraints since these are different syntactic constructions, differing in word order. On the other hand, (76d) wins the competition over (76b) under the pressure of a morphophonological constraint (*AMN'T). Hence morphophonological and syntactic constraints must be involved in the same evaluation process. This is what I called above "global constraint evaluation which is impossible in DO since here morphology is a separate module of the grammar which operates on the output of syntax without any influence on syntactic operations.

But also the Ineffability account as proposed by Marantz is not possible in DO: Conflicting constraints in OT cannot lead to Ineffability, since it is one of the core assumptions of OT that constraint violation and conflict leads not to ungrammaticality, but to conflict resolution.

What I will propose in this section is an account in terms of Ineffability based on the concept of interpretability (subsection 4.5.1). In subsection 4.5.2, it is shown how the data in (76) and related data that seem to require global evaluation of morphosyntactic constraints can be accounted for by local constraints and Ineffability. In subsection 4.5.5, I discuss the problem of modularity under a more general perspective.

4.5.1 Approaches to Ineffability

In this subsection I discuss different approaches to Ineffability[32] and propose a new account which is based on the notion of interpretability. This approach will be used in the following sections to account for apparent cases of global morphosyntactic competition.

[32] See Müller (2000:82-88) for a recent overview of approaches to Ineffability in OT.

Ineffability as the Result of Constraint Conflict

Marantz (1999:5) interprets morphological Ineffability as the situation where "a well-formed syntactic structure fails to yield a pronounceable interpretation because competing morphophonological constraints cannot be reconciled. One case of Ineffability Marantz adduces is the matching requirements for free relatives in German:

(77) a. *Ich zerstöre, was mich ärgert*
I destroy what me upsets
'I destroy what upsets me'

b. **Ich zerstöre wer/wen mich ärgert.*
I destroy who:NOM/ACC me upsets
'I destroy who upsets me'

The idea is that the relative pronoun in these constructions must realize the nominative assigned to the subject position of the embedded relative clause, as well as the accusative assigned from the matrix verb *zerstöre*. This is possible in the neuter gender, where *was* neutralizes the contrast between nominative and accusative, but not in the masculine, where there are two morphologically distinct pronouns.

As Marantz puts it, the "vocabulary item for the relative pronoun must be the winning choice both for the case assigned to the free relative and for the case assigned to the trace of the relative pronoun within the free relative. Where the vocabulary items that win the competition for the two sets of case features are different, the structure is ineffable" (Marantz, 1999:5).

This account is problematic in DO since it is not reconcilable with the basic principles of OT, where constraint conflict in principle does not lead to ungrammaticality. In addition, there are empirical and conceptual problems: First, the account is problematic for other cases where two underlying feature structures induce competition for Vocabulary Insertion. Thus, in fusion (see section 2.2.1 on Georgian prefixes in standard DM) two feature bundles are involved that independently would lead to the insertion of different Vocabulary Items. In contrast to the situation with FRs this does not lead to Ineffability, but to conflict resolution. Second, the account predicts that all cases of non-matching FRs should be ungrammatical. But there are languages where such a case conflict does not lead to ungrammaticality (see Trommer, 2002b, for examples), and even in German there exist grammatical FRs where the case requirements do not match (Vogel, 2002:2):

(78) a. *weil uns besucht, wen Maria mag*
because us visits who-ACC Maria likes

b. *Ich lade ein wem ich vertraue*
I invite who-ACC I trust

An Alternative Approach to Ineffability

As we saw above, existing approaches to Ineffability are not consistent with the architecture of DO and/or problematic for independent reasons. What I will propose here, is that the crucial notion to account for morphosyntactic Ineffability is *interpretability.* To be grammatical, outputs must be both optimal and interpretable. If a certain input I has an optimal output that is not interpretable, I is ineffable.

More concretely, I assume that there are exactly two reasons why the output of a morphosyntactic grammar module might be optimal but non-interpretable and hence leads to ungrammaticality:

Illegibility: The output of a module might not be a suitable input for the subsequent module. This analysis is applied to free relative constructions in Trommer (2002b).

Irrecoverability:[33] The suppression of specific morphosyntactic features or categories is excluded because this might make it impossible to recover the semantic content of a syntactic structure.

Irrecoverability partitions morphosyntactic features into two distinct sets: Recoverable features like person and number features can in prin-

[33] The idea of invoking irrecoverability is inspired by a related approach in Frampton (2002). See section 4.5.3 for discussion.

ciple remain unrealized, while irrecoverable features like the lexical features of verbs must surface. This accounts for the fact that there are many cases of zero agreement and pronouns but virtually no instances of lexical verbs that are not overtly realized. This is unexpected if there is any general economy constraint, which could force suppression of all types of features under appropriate constraint rankings.[34]

I assume that there are additional violable constraints that require the realization of recoverable *and* irrecoverable features, but – by definition – their effect can be overridden by other constraints Thus, while a module might have optimal outputs that suppress the lexical verb completely, such a candidate will not be grammatical. An application of the Irrecoverability criterion will be used in section 5 to account for the Ineffability of certain English negation constructions.

Irrecoverability is a restricted version of the Null-Parse-Account of Ineffability by Prince and Smolensky (1993), while Illegibility is

[34]Note that recoverability is not checking syntactic configurations to determine whether features actually can be recovered in a given construction. For example, pro drop is possible even in a language without agreement such as Japanese. Possible counterexamples to the claim that lexical verbs are never suppressed are sentences such as German *Ich muss nach Hause*, I:NOM must to home, 'I must go home', or *I began the book* implying 'I began to read the book' (thanks to J.D. Bobaljik for coming up with these examples). Interestingly, in English, there is independent evidence that *go* is not a lexical verb: It shows suppletion (*went*), which is otherwise only found in functional elements. See the allomorphy section of the DM-website for discussion (`http://www.ling.upenn.edu/~rnoyer/dm/`).

inspired by the interface conditions of Chomsky (1995)[35]. It is crucial that these conditions do not trigger the formation of candidates that conform to them but simply render candidates ungrammatical that do not satisfy them. In the following subsection, I will show that the data in (76) which seem to require the interaction of constraints from different morphosyntactic modules can be neatly accounted for in terms of Ineffability.

4.5.2 Explaining Morphosyntactic Competition

Joan Bresnan has argued in a number of articles (Bresnan, 1996, 1999, 2001a) for a model of grammar where morphological and syntactic constraints are globally evaluated in the same evaluation procedure.

Her approach is based on Lexical Functional Grammar (LFG, see e.g. Bresnan, 2001b and Falk, 2001). In LFG, syntactic objects are represented by pairs of f-structures and c-structures, where f-structures are complex feature structures encoding mostly language-invariant and semantic properties of sentences, while c-structures are phrase structure representations including constituency and linear order. As a consequence, candidates in OT-LFG are f-structure/c-structure pairs

[35] Müller (1997) uses a similar approach to Ineffability invoking uninterpretability at the LF interface.

and the inputs to morphosyntactic computation are single f-structures. (79) shows schematically the working of this model:

(79)

Input		**Candidates**
f-struct.$_0$	$\Rightarrow$	[f-struct.$_1$,c-struct.$_1$], [f-struct.$_2$,c-struct.$_2$], ...

Crucially, there is only one morphosyntactic evaluation process. Bresnan's arguments in the cited articles are mainly based on negation data in different dialects of English, which I will discuss in the following. I start with a discussion of the role of phonological spell-out in Bresnan's approach.

Phonological Spell-out in (Bresnan, 2001a)

Corresponding to the vocabulary items of DM, Bresnan assumes that the lexicon of a language contains pairings of morphosyntactic features and phonological content. Bresnan simply refers to these items as "pronunciation" and their role in the grammar is rather different from the one that is played by vocabulary items. As an example I take German verb agreement with a 1pl subject which is expressed by the [+pl] affix *-n*. The derivation of this fact in DO can be schematized as in (80):

(80) $$\begin{bmatrix} +1 \\ -2 \\ +\mathrm{pl} \end{bmatrix} \Rightarrow \quad \text{Competition} \quad \Rightarrow \left\langle \begin{bmatrix} +\mathrm{pl} \end{bmatrix} \leftrightarrow /n/ \right\rangle$$

Note that "Competition" in (80) actually comprises a sequential ordering of competition processes, and vocabulary items are only involved in the last one at Morphological Structure. In Bresnan's approach 'pronunciations' are not directly involved in any form of morphosyntactic competition. They just interpret the results of competition. This results in something like (81): The output of the competition process is $\begin{bmatrix} +\mathrm{pl} \end{bmatrix}$ The deletion of +1 and -2 is probably caused by markedness constraint disfavoring these features in this context. That the choice of pronunciation is "competition-free" is symbolized in (81) by the symbol $\Leftrightarrow$:

(81) $$\begin{bmatrix} +1 \\ -2 \\ +\mathrm{pl} \end{bmatrix} \Rightarrow \quad \text{Competition} \quad \Rightarrow \begin{bmatrix} +\mathrm{pl} \end{bmatrix} \Leftrightarrow \left\langle \begin{bmatrix} +\mathrm{pl} \end{bmatrix} \leftrightarrow /n/ \right\rangle$$

Actually, (81) gives a wrong picture of Bresnan's representations. Pronunciations refer to parts of c-structure associated with f-structure. It is not clear if Pronunciations can spell-out single heads or if they always refer to words. The examples Bresnan gives seem to favor the latter hypothesis. Thus, she gives something like the following[36] (Bresnan, 2001a:35):

$$\text{(82)} \qquad isn't : \left\langle V_f^0 + ninfl \begin{bmatrix} BE \\ PRES \\ 3 \\ SG \\ NEG \end{bmatrix} \leftrightarrow /n/ \right\rangle$$

English Negation

Bresnan claims that syntactic constructions sometimes block morphological ones. She illustrates this with the expression of negation in different dialects of English. For example, in Hawick Scots, three possible realizations of negation exist which appear in different (partially overlapping) morphosyntactic contexts: *nae*, a clitic usually adjoined to IP, *n't*, a suffix, and *no*, a full form. An adequate analysis must then fix for every syntactic configuration which markers are possible and which are not.

[36]This example is reconstructed from the corresponding 1st person form, which according to Bresnan is zero (**amn't*). See the discussion below.

Bresnan starts from the observation that there are different means to express negation in different languages and often even in one and the same language. (affixes, negation verbs, etc.) Bresnan relates the choice of a negation strategy one by one to different markedness constraints. (p. 22)

(83)

Negation Strategy	**Markedness Constraints**
Analytic negation adjoined to	*NEG-C, *NEG-I,
C,I,V,VP	*NEG-V, *NEG-VP
Negation by an affix on an auxiliary	*NINFL-V^0_f
Negation by an affix on a lexical verb	*NINFL-V^0_{lex}
Negation lexicalized as a verb	*NEG-LEX-V

As long as no other constraints interfere, the choice of negation type simply depends on the ranking of these constraints: Everything else equal, The strategy which corresponds to the lowest-ranked markedness constraint is chosen since it involves the least serious constraint violations.

But, as there are different means and positions to express negation, there are also different semantic scope positions which are expressed by the position of negation. The following faithfulness constraint requires that scope is overtly marked in the output Bresnan (2001a:24):

(84) **FAITH^{NEG}:** preserve input scope of negation in the output

In Hawick Scots, sentence negation, Neg is expressed by *nae*, which is analyzed by Bresnan as the marker for negation adjoined to INFL. The appearance of *nae* in sentence negation is then accounted for by the following ranking (85). As expected, *nae* as the marker corresponding to the lowest-ranked markedness constraint (*NEG-I) is chosen. The input scope is represented in (85) schematically by bracketing (Bresnan, 1999:14):

(85) **Input:** ¬(POSS(work(he)))

	*NEG-C	FAITH^{NEG}	*NEG-VP	*NINFL-V^0_f	*NEG-I
he couldn't work				*!	
☞ he couldnae work					
he could no work			*!		

A different result is obtained for questions, where we find the negation markers *n't* and *no* instead. *n't* according to Bresnan is an affix attached to *could* while *no* expresses negation adjoined to VP. By assumption (i.e., by crucially higher ranked constraints), I in Hawick Scots questions must appear in the sentence-initial complementizer position C. For this reason, the constraint *NEG-C, which was irrelevant in (85) becomes decisive, since *nae* (now in C) would now violate the highest-ranked markedness constraint. *no* and *n't*) avoid this violation, *no* since it is lower than C and *n't* since it is not adjoined to C, but an affix (Bresnan, 1999:14):

(86) **Input:** Q(¬(POSS(work(he))))

	*NEG-C	FAITH^{NEG}	*NEG-VP	*NINFL-V^0_f	*NEG-I
☞ couldn't he work?				*	
couldnae he work	*!				
☞ could he no work			*		

Standard English is analyzed by Bresnan in a similar way, using the same constraints:

(87) **Input:** ¬(POSS(work(he)))

	*NEG-C	FAITH^{NEG}	*NEG-VP	*NINFL-V^0_f	*NEG-I
☞ he can't have been working					*
☞ he cannot have been working				*	
he can not have been working			*!		

Bresnan uses the orthographically contracted form *cannot* to express Neg adjoined to VP (Scots *nae*), which is not phonologically different from Neg in I in Standard English (*can not*). *NEG-VP is ranked higher here than the tied constraints *NEG-I and *NINFL-V^0_f which means preference for the two possibilities where Neg is not adjoined to VP. For the same reasons as in Hawick Scots, in interrogatives only "reduced" negation is possible, as shown in (88). What makes these data awkward is the fact that these constraints seem to interact with morphophonological constraints. This seems to be true in the case of the impossible combination **am'nt*.

(88) **Input:** Q(¬(POSS(work(he))))

	*NEG-C	FAITH^{NEG}	*NEG-VP	*NINFL-V^0_f	*NEG-I
☞ can't he have been working?					*
cannot he have been working?	*!			*	
can he not have been working?			*		

In declaratives, where **am'nt* would be expected, in analogy to the corresponding contracted 3rd person form (*Isn't he working*), only *am not* is possible:

(89) **Input:** declarative

	*am'nt	*NEG-C	FAITH^{NEG}	*NEG-VP	FAITH$^{P\&N}$	*NINFL-V^0_f	*NEG-I
I amn't working	*!					*	
I aren't working				*	*!	*	
☞ I [am not] working							*
I am [not working]				*!			

While **am'nt* is also impossible in interrogatives, here the conflict is resolved in a different way. The default form *are* is used instead of the 1sg form *am*. This leads to a violation of the constraint FAITH$^{P\&N}$ which requires the realization of person and number features. This violation is tolerated to avoid the violation of the higher ranked *AMN'T. In contrast to the declarative input, the analytic form *am not* is impossible since this would violate *NEG-C, which is again higher ranked than *NINFL-V^0_f and *NEG-I:

(90) **Input:** interrogative

	*am'nt	*NEG-C	FAITH^{NEG}	*NEG-VP	FAITH$^{P\&N}$	*NINFL-V^0_f	*NEG-I
Amn't I working	*!					*	
☞ Aren't I working					*	*	
Am not I working		*!					*
Am I [not working]				*!			

The general point these data provide in favor of an global OT account is the following: We have one conflict (the otherwise perfect form *amn't* cannot appear), and instead two different strategies are used. In declarative contexts (89), a different syntactic construction is used instead (analytical *am not*). In an interrogative context, **amn't* is replaced by a minimally less specified item (*aren't*). To describe the first solution, we need syntactic constraints (e.g. *NEG-VP), for the second one spell-out constraints (*AMN'T and FAITH$^{P\&N}$). To describe both scenarios, the two kinds of constraints have to interact. This means globality of constraint evaluation.

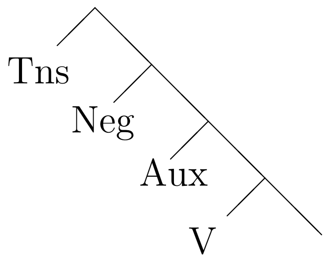
Why English Negation does not Imply Global Competition

While Bresnan's arguments seem rather compelling, they depend crucially on the model of grammar Bresnan presupposes. In this section I show how the data can be derived in a postsyntactic account. To start with, we have to determine the relevant syntactic structures which form the input at Morphological Structure. Consider the sentences in (91):

(91) a. *Isn't she coming?/*Is not she coming.*
b. *She isn't coming/ she is not coming.*
c. **Is shen't coming./?Is she not coming?*

For all negated sentences, I assume the following basic phrase structure:

(92)



With Frampton (2002), I assume that in (92b) the auxiliary (Aux) has moved to Tense and attracted the negation head (Neg) (93b)[37]. In questions, this complex has moved to the question head Q in the complementizer position to yield (93a). (92c) corresponds to (93c). This option seems to be only marginally possible in standard dialects of English. I assume that it results in dialects or registers where there is no obligatory attraction of Neg to Aux. See section 4.5.3 for more discussion.

(93) a. [[[Aux Tense] Neg] Q]
b. [[Aux Tense] Neg]
c. [[Aux Tense]Q] ... [Neg]

Since both, (93a) and (93b), form spell-out domains, the competition between *isn't* and *is not* happens at Morphological Structure (MS)

[37] Wilder (1997:345) argues that *not* is not "a head governing VP, but a phrasal satellite, like an adverbial." This analysis is in principle also compatible with the account of reduction proposed in the next section as long as the vocabulary item *not* is not related one-by-one to "phrasal" negation.

inside the predicted locality domain. No matter how this competition is modeled in detail, it can be located in one module of the grammar (MS) and no violation of the modularity assumption is necessary. In the following sections, I develop one possible analysis. The starting point is the assumption of two vocabulary items for negation:

(94) a. /not/ $\leftrightarrow$ [+Neg]
     b. /n't/ $\leftrightarrow$ [+Neg]

There are two options to account for the different distribution of /n't/ and /not/ in (91): By lexical stipulation or by additional constraints. Frampton (2002) assumes the first alternative. In the following, I will explore the second possibility.

An Alternative Analysis

The idea behind the constraint-based analysis I will propose is to formalize the well-documented observation that elements which are syntactically bound tend to be phonologically reduced. Clearly, /n't/ is a reduced form of /not/, and Neg in the head-adjunction structures (HAS) of (93) exhibits different degrees of embeddedness. Thus we have the hierarchies in (95): "Free" refers to (93c) where Neg is not part of a HAS, "peripheral" to (93b) where it is the outermost head of a HAS, and "embedded" to a Neg that is deeper embedded in a HAS (93a). I leave it open here what is the exact phonological correlate of weak and strong:

(95) a. **Phonological weight:** Strong form $\gg$ weak form

b. **Embededness:** Free $\gg$ Peripheral $\gg$ Embedded

Now interestingly, the two hierarchies correlate: The less embedded a negation marker is in the terms of (95b), the more likely is it to be weak. This is shown schematically in (96):

(96)

	Syntactic Structure	**Description**	**Reduction**
a.	[[[Aux Tense] Neg]Q]	Embedded part of HAS	obligatory
b.	[[Aux Tense] Neg]	Peripheral part of HAS	possible
c.	[Aux Tense] ... [Neg]	Not part of HAS	impossible

This observation can be captured by harmonic alignment (Prince and Smolensky, 1993; Aissen, 1999) of the two hierarchies in (95) into the following fixed constraint hierarchies:[38]

[38]In de Lacy (2001) it is argued that harmonic alignment and hence (universally) fixed constraint ranking can be dispensed with in phonology. This is also possible for the analysis of negation presented here. Thus, the constraints in (70) could be replaced by *strong/Adjoined and *strong/Embedded where Adjoined = {Embedded or Peripheral}, and a counter constraint

(97) a. *strong/Embedded $\gg$ *strong/Peripheral $\gg$ *strong/Free

b. *weak/Free $\gg$ *weak/Peripheral $\gg$ *weak/Embedded

In the following, I will show how the distribution of negation markers follows from an interspersing of these constraint hierarchies with other constraints, where the constraints are roughly ranked as follows:

(98)
$$\text{*weak/Free} \gg \ldots \gg \text{*strong/Embedded} \gg \ldots \gg \left\{ \begin{array}{l} \textbf{*strong/Peripheral} \\ \textbf{*weak/Peripheral} \end{array} \right\} \gg \ldots \gg \left\{ \begin{array}{l} \text{*strong/Free} \\ \text{*weak/Embedded} \end{array} \right\}$$

Crucially *strong/Peripheral and *weak/Peripheral are tied, i.e. not ranked with respect to each other, which accounts for the optionality of *not* or *n't* in declaratives. Note that all these constraints are relativized to specific input structures, and are irrelevant for other inputs. For example, if Neg is embedded, all constraints over free and peripheral inputs are vacuously satisfied. In the following I will omit all constraints that are irrelevant in this way from discussion and from the tableaux. (99) to (101) show how the data from (91) can be captured. For comprehensibility, full sentences are given. The items that are actually involved in the evaluations are in boldface:

*weak/X under the ranking *strong/Adjoined,*weak/X $\gg$ *strong/Embedded. Since the pro and contra of fixed constraint rankings is not crucial at this point, I will adopt here harmonic alignment.

(99) **Input:** [[[Aux Tense] Neg]Q] (embedded Neg)

	*strong/Embedded	*weak/Embedded
☞ **Isn't** she coming?		
Is not she coming?	*!	

(100) **Input:** [[Aux Tense] Neg] (Peripheral Neg)

	*strong/Peripheral	*weak/Peripheral
☞ She **isn't** coming		*
☞ She **is not** coming	*	

(101) **Input:** ([[Aux Tense]Q] ...) [Neg] (free Neg)

	*weak/Free	*strong/Free
Is she **n't** coming?	*!	
☞ Is she **not** coming?		*

Let us now look at the corresponding sentences in the 1st person:

(102) a. **Amn't I coming?/*Am not I coming?/Aren't I coming.*

b. **I amn't coming/ I am not coming.*

c. **Am In't coming/?Am I not coming?*

The simplest case is (102b). Here I assume that a high-ranked morphophonological constraint against the sequence **amn't* prevents *I amn't coming*. Note that we also have to exclude forms with *are* instead of *am*, which we find in (102a). This is achieved by PARSE PER-NUM which stands here as a shorthand for all relevant PARSE constraints.

(103) **Input:** [[Aux Tense] Neg] (Peripheral Neg)

	*AMN'T	PARSE PER-NUM	*strong/Peripheral	*weak/Peripheral
I **amn't** coming	*!			*
☞ I **am not** coming			*	
I **aren't** coming		*!		*
I **are not** coming		*!	*	

In interrogative sentences as in (102-a), *strong/Embedded and hence the ranking of this constraint with respect to PARSE PER-NUM becomes relevant. Since *strong/Embedded is ranked higher, the form *aren't* is chosen which does not realize the underlying person and number features, but satisfies *strong/Embedded:

(104) **Input:** [[[Aux Tense] Neg] Q] (Embedded Neg)

	*AMN'T	*strong/Embedded	PARSE PER-NUM	*weak/Embedded
Amn't I coming?	*!			*
Am not I coming?		*!		
☞ **Aren't** I coming?			*	*
Are not I coming?		*!	*	

Finally, if negation is "stranded" below the subject, Neg forms its own spell-out domain. The only relevant *strong-constraint is ranked below *weak/Peripheral. Therefore, the full form is chosen:

(105) **Input:** [Neg] (Free Neg)

	*weak/Free	*AMN'T	PARSE PER-NUM	*strong/ Free
Am I **n't** coming?	*!			
☞ Am I **not** coming?				*
Are I **n't** coming?	*!		*	
Are I **not** I coming?			*!	*

Hawick Scots

Negation in Hawick Scots a Scottish dialect of English also treated by Bresnan, differs from English only in small details. First, there is no ban on *amn't*, Hence there is no difference between negation with 1sg and other forms. Second, as noted before, there are three negation markers. /no/ and /n't/ which roughly correspond to Standard English /not/ and /n't/ and the phonological clitic /nae/. (106) hows the distribution of these markers:

(106) a. **Am no I happy?/*Amnae I happy?/Amn't I happy?*

b. *I am no happy/I amnae happy/*I amn't happy*

c. *Am I no happy?/*Am I nae happy?/*Am I n't happy?*

It is natural to extend the phonological height hierarchy from (95-a) to (107):

(107) **Phonological weight hierarchy:**

Strong form (no) $\gg$ clitic $\gg$ weak form

But, since harmonic alignment is based on binary scales, I assume that this is decomposed in two binary hierarchies, as in (108)

(108) a. [+dependent] $\gg$ [-dependent]

b. [+deficient] $\gg$ [-deficient]

"deficient" (+def) corresponds to not including a potential syllable nucleus (a vowel, /n't/). "dependent" (+dep) refers to prosodic dependency i.e. the incapacity of an item to form a prosodic word on its own, which seems to be true of /n't/ and /nae/. (109) shows the assumed feature values for the Hawick Scots negation markers:

(109) Feature Values for Hawick Scots Negation Markers:

	+dep	**-dep**
+def	*n't*	–
-def	*nae*	*no*

Again, phonological weight corresponds closely to syntactic embeddedness:

(110)

	Syntactic Structure	**Description**	**Reduction**
a.	[[[Aux Tense] Neg]Q]	Embedded part of a HAS	[+dep+def] (*n't*)
b.	[[Aux Tense] Neg]	Peripheral part of a HAS	[-def] (*nae,not*)
c.	[Aux Tense] . . . [Neg]	Not part of a HAS	[-dep-def] (*no*)

Harmonic alignment of the scales in (108) with the embeddedness scale from (95-b) gives the constraint rankings in (111):

(111) a. *dep/Free $\gg$ *dep/Peripheral $\gg$ *dep/Embedded

b. *ndep/Embedded $\gg$ *ndep/Peripheral $\gg$ *ndep/Free

(112) a. *def/Free $\gg$ *def/Peripheral $\gg$ *def/Embedded

b. *ndef/Embedded $\gg$ *ndef/Peripheral $\gg$ *ndef/Free

To account for the distribution of the single markers, the constraint ranking must include the three subrankings in (113):

(113) a. *ndep/Embedded,*ndef/Embedded $\gg$
dep/Embedded,*def/Embedded

b. *def/Peripheral $\gg$ *dep/Peripheral,*ndep/Peripheral $\gg$
*ndef/Peripheral

c. *dep/Free, *def/Free $\gg$ *ndep/Free, *ndef/Free

In (113a), *ndep/Embedded,*ndef/Embedded are ranked highest which ensures that the negation markers in standard questions will be [+dep +def], hence /*n't*/. In a symmetric fashion the high-ranking of *dep/Free and *def/Free ensures a [-dep -def] element for free negation, which is /*not*/. The tied ranking of *dep/Peripheral,*ndep/Peripheral has the effect that /*no*/ and /*nae*/ are equally harmonic in declaratives. Since *def/Peripheral is ranked higher and *ndef/Peripheral lower than these constraints the [+def] element /*n't*/ is excluded in this position. Since the options Embedded, Peripheral and Free are mutually exclusive, the constraints from a., b. and c. in (113) do not interact. Thus, all that we need is an overall ranking which obeys the subrankings in (113) and (111):

(114)
$$\left\{\begin{array}{l}\text{*dep/Free}\\ \text{*def/Free}\end{array}\right\} \gg \begin{array}{c}\text{*def/}\\ \text{Peripheral}\end{array} \gg \left\{\begin{array}{l}\text{*ndep/Embedded}\\ \text{*ndef/Embedded}\end{array}\right\} \gg$$
$$\left\{\begin{array}{l}\text{*dep/Peripheral}\\ \text{*ndep/Peripheral}\end{array}\right\} \gg \text{*ndef/Peripheral} \gg$$
$$\left\{\begin{array}{l}\text{*dep/Embedded}\\ \text{*def/Embedded}\end{array}\right\} \gg \left\{\begin{array}{l}\text{*ndep/Free}\\ \text{*ndef/Free}\end{array}\right\}$$

4.5.3 Ineffability Again

Bresnan (1999:17) hints at the possibility that there are speakers that spell out sentence negation by *Am I not working?* instead of **Amn't I working?* and *Aren't I working?* i.e. the latter are outranked. If **Amn't I working?* and *Am I not working?* are candidates in the same competition involving *AMN'T, this cannot happen at MS, since the subject *I* is not part of the same spell-out domain as *am*. Again, this seems to force us to give up modular constraint evaluation. But, as Marantz (2000:3) points out, Bresnan's analysis

(115) "makes the prediction that dialects that allow *Am I not leaving?* instead of *Aren't I leaving?* should disallow *Is he not leaving?*. That is, *Am I not leaving?* should be much better as a sentential negation than *Is he not leaving* in such dialects since *amn't drives the grammaticality of *Am I not*

> *leaving?* while *isn't* is a fine word. However Bresnan presents no evidence that there is such a ^{ok}*Am I not leaving?/*Is he not leaving?* dialect, and discussions with native speakers of *??Aren't I leaving?* dialects suggests that there is no such dialect. Thus Bresnan's specific proposals are untenable, regardless of the the theoretical assumptions."

This means that in dialects where *Amn't I leaving?* is ungrammatical and cannot be replaced by **Aren't I leaving?*, we have again Ineffability.[39] In the modular approach, advocated in this thesis, this can be captured by assuming that high-ranked *AMN'T leads to an output for the underlying sentence where Neg is not spelled out at all. (Note that in the preceding tableaus I have assumed silently that PARSE NEG is ranked high enough to prohibit the null parse for Neg.) Following the approach of Frampton (2002) we can make the plausible assumption that NEG is an irrecoverable feature. Hence, the optimal candidate is *Am I leaving?*, which is irrecoverable, and therefore ill-formed. But since it is optimal at MS, no other candidate can be used instead:

[39] See Frampton (2002) for more discussion of the empirical evidence that Ineffability in this domain exists.

(116) **Input:** [[[Aux Tense] Neg] Q] (Embedded Neg)

	*AMN'T	*strong/Embedded	PARSE PER-NUM	PARSE NEG
Amn't I coming?	*!			*
Am not I coming?		*!		
Are not I coming?		*!	*	
Aren't I coming?			*!	
☞ **Am** I coming?				*

4.5.4 How to Treat Paradigm Gaps

As is predicted by the modular architecture of DO, morphophonological constraints such as *AMN'T are evaluated locally. Thus, this account is superior conceptually to the one by Bresnan since it is more restricted. But Bresnan's account is also problematic empirically, as we saw in the last section, since it predicts competition effects that are not documented. Finally, the account in terms of morphophonological constraints determining the choice of negation markers, predicts the phonological differences between the negation markers in Standard

English and Hawick Scots which are completely accidental in Bresnan's account. Taken together, an approach using local morphological competition seems to give a better account of the data.

In the rest of this section, I will briefly discuss one further difference of my analysis to Bresnan's account. Bresnan claims that the ban on **amn't* can be derived in her framework "...by means of a universal constraint ..." (99:17), elaborated in Bresnan (2001a). The assumption there is that the pronunciation of the negated form for *be* (i.e. for non-existing **amn't*) is zero. Bresnan now assumes a high-ranked constraint LEX that forbids such zero pronunciations and therefore favors other forms. In other words, there is no constraint like *AMN'T, but an empty pronunciation that corresponds to this (expected) form, and a constraint that blocks the empty pronunciation.

I think that this account is in no way an improvement over a constraint like **AMN'T*, since it introduces an item which is not only zero (which is impossible in the more restricted framework of DO) but also never surfaces, since its only sense of being is to favor other candidates. In fact, this means two zero items since the verb stem as well as negation are zeroified. The proposal also runs counter to the spirit of Bresnan's approach, where the Lexicon is claimed "not to be the source but the result of syntactic variation (99:2). Finally the assumed universal constraint" (LEX) "is used only for truly accidental gaps" (99:35, fn. 35). Again, this underlines the stipulative nature of Bresnan's account and makes a morphological constraint against **amn't* as least as plausible.

4.5.5 Modularity and Restrictiveness

A major appeal of a modular architecture is its restrictiveness. If a module M_1 generates the input of a second module M_2, it is predicted that M_1 influences (via its output) M_2, but that there is no comparable influence in the opposite direction. Thus, much of the work on the morphology/syntax interface in the eighties and in the early versions of the Minimalist Program (Chomsky, 1995) followed the idea that morphology consists of an autonomous word-formation module that feeds syntactic computations. In such a "lexicalist" model, morphology drives syntax, but not vice-versa. However, plenty of evidence has been amassed that morphological structure is in many ways sensitive to syntactic structure (see Marantz, 2001 and chapter 2 for discussion), and the English negation data discussed in 4.5.2 constitute a further piece of evidence supporting this conclusion: A lexicalist model has no way to cope with the problem that *am not* competes with *amn't*. The competition which would be necessary to do so cannot be located in Morphology, since *am not* under this approach is not a morphological object. And it cannot be located in syntax because a morphological constraint has to be evaluated (*AMN'T).

Hence, the modularity assumption seems to have failed.[40] However, it has never been convincingly shown that morphology really drives syntax in the sense that syntactic computations are sensitive to morphological details. Symptomatically even work started under the assumption of such an influence comes to the conclusion that the influence is just the other way around (cf. Bobaljik, 1995).[41] In this section, I have argued that data which seem to show that morphological detail influences syntactic computation can be fruitfully reanalyzed in terms of constraint evaluation restricted to MS and that idiosyncratic

[40]Lexicalist approaches usually assume that the morphology component generates word-internal phrase structures and provides a phonological spell-out for these structures. While spell-out in DO happens after syntax for all structures, it is in principle possible that there are two structure-building devices, (one for word-internal and one for word-external syntax) interacting in a specific manner. Such a proposal is put forth in Ackema and Neeleman (2000). Since the same authors seem also to assume that spell-out is sensitive to word-external context (Ackema and Neeleman, 2001), this seems to open up a further dimension of modularity. Here, I assume with Marantz (2001) that the distinction between word-internal and -external syntax is captured in terms of different syntactic configurations in the same syntactic module.

[41]Bobaljik discusses the fact that the (im)possibility of AgrS and Tense cooccuring in a single verb form (e.g. **hint-ed-s*) covaries with certain syntactic properties such as the possibility of object shift and the acceptability of Transitive Expletive Constructions. In chapter 1 of his thesis, he proposes an account where the syntactic facts follow from the morphological restriction. In chapter 5 he revises the analysis and comes to the conclusion that the morphological constraint is just a consequence of a syntactic parameter.

constraints at MS cannot influence the evaluation process selecting optimal syntactic structures, as was shown for the ban in *amn't* in section 4.5.2. These results strengthen further the hypothesis that syntax triggers morphology, but not vice versa. If this turns out to be correct, it should be reflected in some way in our conception of Universal grammar. The architecture of DO as proposed in this thesis is a concrete proposal how this goal can be achieved.

4.6 Further Issues

4.6.1 Lexicon Optimization

Bresnan (2001a, 1999), Wunderlich (2000a) and Grimshaw (2001) suggest that the featural content of VIs might ultimately be reducible to the working of independently needed constraints. Thus, in a language with a high-ranked constraint PARSE [+3 +Nom +pl], we would expect a VI with the feature content [+3 +Nom +pl] that satisfies it. All that we have to do in addition is to say that [+3 +Nom +pl] is spelled out by, say, *-en* as in Georgian. While it may be ultimately desirable to relate VIs and constraints, I think that it is premature in the face of our current understanding of morphology because lexicon optimization in the cited works has considerable problems: *First*, lexicon optimization in the proposed form does not lead to any removal of redundancy. With lexicon optimization, we have to state that [+3 +Nom +pl] is spelled out by *-en* but without optimization we do not have to state anything more[42]. In practice, it might even lead to unnecessary redundancy since the constraints needed might not be independently motivated (i.e. are only motivated by the desire to describe the affix inventory . For example, Bresnan (2001a:17) assumes the high-ranked constraints *PL and *2 which penalize realization of the features PL and 2 (in addition to low-ranked *1, *2, and *SG) to describe the fact that for the verb *be* in Standard English no specific form exists for second person or plural categories, which are expressed instead by *are* which is assumed to be unspecified for person and number:

(117) Present Tense Paradigm of 'be'

	sg	**pl**
1	*am*	*are*
2	*are*	*are*
3	*is*	*are*

However, the only reason to introduce these constraints is to do lexicon

[42]One might argue that the difference is between (i) there is a unit [+3 +Nom +pl], and it is spelled out *en* (without LO) and (ii) if there is a unit [+3 +Nom +pl], then it is spelled out *en* (without LO), and the second is slightly weaker, but this seems hardly more than a game of words.

optimization. The same results can be derived when one simply does away with these markedness constraints. There might be a point in such constraints if they predict plausible VI inventories while judging implausible ones as impossible. It is hard to see if Bresnan's system achieves this goal. Note that the system allows for any situation where only one cell of (117) is filled by a distinctive form. On the other hand, it is to weak to derive the present paradigm of Modern High German, where the difference in person is neutralized only in the 1st and 3rd plural:

(118) Present Tense in German

	sg	**pl**
1	*gehe*	*gehen*
2	*gehst*	*geht*
3	*geht*	*gehen*

If one ranks high *PL, the 2pl also should be neutralized, with high-ranked *1,*3 also 1sg and 3sg should be. Bresnan could assume a constraint like *[1 PL] *[3 PL], but if one allows such constraints one literally has the means to neutralize every cell of a paradigm individually, hence we can stipulate every conceivable inventory.

One of the most convincing analyses in terms of lexicon optimization is that of Grimshaw (2001) who shows that Italian 1st and 2nd person clitics systematically do not mark gender, case and reflexivity, while this contrast is expressed in 3rd person clitics:

(119) Italian Pronominal Clitics

	non-refl.	**refl.**
1	*mi*	*mi*
2	*ti*	*ti*
3	*la/lo*	*si*

But if the decomposition analysis of Romance clitics sketched in section 4.1.2 is correct, this means for the most part not that vocabulary items are optimized but their combination. For example, if *m-* in *mi* (1sg) and *-e* in *le* (3.sg dat fem) cannot give *me*, this should be guided by constraints such as IMPOVERISH([+1], [+case]), but the inventory to form *me* of course exists. For many aspects, it is questionable whether there are universal bases of affix inventories. Consider for illustration some cases that come to mind (*lát*, 'see'; *xatav*, 'draw' *kuma*, 'come'). There is no unique correlation between zero affixation (i.e. lack of a VI) and person:

(120) Zero Affixation and Person in Three Paradigms

	Hungarian	**Georgian**	**Bavarian**
1	*lát-ok*	*v-xatav*	*kum-Ø*
2	*lát-sz*	*xatav-Ø*	*kum-st*
3	*lát-Ø*	*xatav-s*	*kum-t*

While generally in plural categories there is more neutralization in person than in singular, this is not true for French, where the singular forms are all homophonous but not the plural forms which are all phonologically different (*manger*, 'eat'):

(121) French Present Tense Paradigm

	sg	**pl**
1	*mange*	*mangon*
2	*manges*	*mangez*
3	*mange*	*mangent*

Looking only at singular forms, all imaginable cases of person neutralization exist (*sollen*, 'shall', *mësoj*, 'learn'):

(122) Person Syncretisms in Singular Paradigms

	German Modals	**Albanian**	**English**
1	*soll*	***mëso-j***	*come*
2	***soll-st***	*mëso-n*	*come*
3	*soll*	*mëso-n*	***come-s***

This is not to deny that there are general principles in the form of constraints favoring certain neutralizations over others nor that they favor certain VI inventories. The point is that at the moment it seems that such inventories have some autonomy against these constraints.

4.6.2 Feature Hierarchies

In the earliest work on OT-morphology (e.g. Noyer, 1993b), there is an appeal to feature hierarchies e.g. for parsing constraints. Such fixed hierarchies have been shown to be problematic in section 2.2.6. Another type of reference to feature hierarchies will be discussed in chapter 7. In both cases, I argue that reference to feature hierarchies should be replaced by the reference to hierarchies (rankings) of constraints.

4.6.3 The Interface of Morphology and Phonology

Most work on morphology in an OT-framework is settled at the interface of morphology and phonology. This includes most work on prosodic morphology as infixation (Prince and Smolensky, 1993) and reduplication McCarthy and Prince (1995). While it will ultimately prove important to connect this line of research with the one at the syntactic interface that is presented here, this is beyond the scope of this thesis. This is also true for constraints on morphophonemics, touched at several points of this chapter (e.g. 4.5 and 4.1.3). Another line of research discusses the thesis that morphemes are not entities but themselves constraints (Hammond, 1997; Russel, 1995), or bundles of constraint violations (Golston, 1996). The main concern of this work is again the interaction of morphemic constraints with phonological ones and/or the proper treatment of nonconcatenative phenomena as apophony or subtractive morphology. While especially Golston (1996) is an ingenious account of certain phenomena, all of these approaches have difficulties, as far as I can see, to manage morphological formations with more than one affix. Since affixes are not discrete entities, it is also unclear how constraints on affix order, which are a main concern of this thesis, can be coded in such a framework.

Chapter 5

Theories of Affix Order

In DM, affix order mirrors underlying syntactic representations. This fact is obscured however by purely morphological factors. I will adopt this basic picture but propose a radical alternative to its implementation in standard DM: While morphology mirrors rather directly the affix order of contentful heads, such as aspect and tense, the order of late-inserted agreement affixes is determined by morphological well-formedness constraints concurring with constraints that require the mirroring of the agreement-host relation. This allows to explain language-internal and cross-linguistic systematicity in affix order in a way that is unavailable in standard DM. In 5.1, I introduce the "Dash- and Mirror-Model" (DMM), which underlies the conception of affix order in standard DM. Problems with this model are discussed in 5.2. It is shown that lexicalist and amorphous approaches to affix order – often also incorporating a variant of the DMM – do not improve over the DM account (5.4). The same is shown to be true for existing OT-approaches to affix order (5.5). The antisymmetric approach (5.3) is argued to be basically correct for most types of inflectional affixes but to be problematic for agreement affixes. Consequently, in chapter 6 a DO account will be presented, which combines the antisymmetric approach with the assumption that the order of agreement affixes is determined by the ranking of universal, violable constraints.

5.1 The Dash- and Mirror-Model (DMM)

DM shares with most modern approaches that adopt post-syntactic morphology[1] the adherence to a form of Baker's (1985) Mirror Principle. The specific form this takes in DM is the assumption that spell-out happens cyclically "from the stem outwards". To make this statement more formal, let us assume a standard head-adjunction structure as in (1) resulting from successive cyclic head-movement of V to T and SAgr:[2]

[1]For example Baker (1988), Ouhalla (1991), Lieber (1992), Brody (1997) and Cinque (1999), but see also Anderson (1992) and Emonds (1985).

[2]For ease of exponence, SAgr is assumed here to be a syntactic head. Nothing essential changes if it is taken to be adjoined to Tense after syntax as proposed in Halle and Marantz (1993). The

(1) $[[[\mathrm{V\ T}]_{\mathrm{T}}\ \mathrm{SAgr}]_{\mathrm{SAgr}}$

We can now say that at spell-out a head H_1 is spelled out before a head H_2 iff H_1 is asymmetrically c-commanded by H_2, where asymmetrical c-command is defined as in (2):

(2) H_1 asymmetrically c-commands H_2 iff the first branching node that dominates H_1 also dominates H_2, and H_1 is not dominated by any segment of Category(H_2).

If it is further assumed that there is universally the same functional phrase structure (e.g. SAgr is always higher in the phrase structure than Tense), and that there is no excorporation, i.e. there is no upwards head-movement of proper sub-parts of (1), the DMM makes a strong prediction: Categories situated higher in the tree should always be located outwards from categories from more innermost categories. Assuming again that SAgr is higher than Tense, this means that the orders V Tense SAgr and SAgr Tense V should be possible, but *Tense SAgr V and *V SAgr Tense should be impossible.

The central parameter of variation in this type of account is the stipulation that specifies specific affix VIs idiosyncratically as prefixes or suffixes: According to the respective parameterization, the following

latter position will also be adopted in 6.4.1.

realizations of (1) are possible:

(3)

Vocabulary Items	**Output**
SAgr-, T-	SAgr-T-**V**
-SAgr, -T	**V**-T-SAgr
SAgr-, -T	SAgr-**V**-T
-SAgr-, T-	T-**V**-SAgr

Note that this allows freely for different affixes of the same type having different position. Thus, there is no problem in assigning the following forms from Georgian hierarchically identical inputs:[3,4]

(4) a. *v-xedav* 'I see'
S1-see

b. *xedav-s* 'he sees'
see-S3s

Putting everything together, the basic claim that DM makes along with most Mirror-Principle-based accounts is that the closeness of affixes to stems – reflecting hierarchical structure – is systematic while affixal status is not. I will call this model the "Dash- and Mirror-Model"

[3]This analysis is chosen here only for illustrative purposes and does not correspond to Halle and Marantz (1993)'s account of Georgian.

[4]Noyer (1992) also allows for the possibility to underspecify the affixal status of affixes to account for cases where individual affixes turn up as prefixes or suffixes according to the phonological context.

referring to the dashes that mark affixal status in Standard DM.

To be sure, there are additional devices that are used in DM analyses to ensure correct linear order of affixes and might obscure the closeness of affixes to stems: Bonet (1991) uses templates to describe the precedence relations in Romance clitic clusters. Embick and Noyer (1998) introduce "local dislocation" rules, which are able to interchange linearly adjacent VIs. As the idiosyncratic specification of affixal status, these devices are language-particular stipulations that are to be avoided if possible. In the next section, it will be shown that templates and local dislocation also fail to save the DMM from its shortcomings and that it is preferable to abandon this model in its current form.

5.2 Arguments against the DMM

5.2.1 Systematicity in Affixal Status

In the ideal case, every aspect of affix order in a given language should be derivable from general and, possibly, universal principles. Under this perspective, it is a general weakness of the DMM that, given an inflectional head, it does not make any predictions if this will surface as a prefix or a suffix. Of course if it turns out that specific affix types occur in a random manner and with equal frequency as prefixes or suffixes, no improvement over the DMM *can* be achieved. But as will be shown in this section, the order of affixes w.r.t. stems is in most cases highly systematical both in single languages and crosslinguistically.

Language-Internal Systematicity

Taking a standard Indoeuropean language like Albanian, virtually all inflectional affixes on a verb, in particular tense and agreement markers, are suffixes.

(5) Albanian Verb Paradigm

	prs	**impf**	**aor**
1sg	*puno-j*	*puno-j-a*	*puno-v-a*
2sg	*puno-n*	*puno-j-e*	*puno-v-e*
3sg	*puno-n*	*puno-n-te*	*puno-Ø-i*
1pl	*puno-jmë*	*puno-n-im*	*punua-Ø-m*
1pl	*puno-ni*	*puno-n-it*	*punua-Ø-t*
3pl	*puno-jnë*	*puno-n-in*	*punua-Ø-n*

In the Dash- and Mirror-Model there is no way to express this regularity. The fact that all agreement markers (*-j*, *-n*,*-jmë*, *-ni*, *jnë*, *-a*, *-e*,

...) are suffixes can only be expressed by stating for each item separately that it is a suffix. To take a more complex example, consider the Amharic agreement paradigms in (6):

(6) Amharic Conjugations Patterns (Leslau, 1995:287,301)

			Imperfect	**Perfect**
3.	**sg.**	**masc**	*yə-säbər*	*säbbär-ä*
3.	**sg.**	**fem**	*tə-säbər*	*säbbär-äcc*
2.	**sg.**	**masc**	*tə-säbər*	*säbbär-h*
2.	**sg.**	**fem**	*tə-säbr-i*	*säbbär-sh*
1.	**sg.**		*ə-säbər*	*säbbär-hu*
3.	**pl.**		*yə-säbr-u*	*säbbär-u*
2.	**pl.**		*tə-säbr-u*	*säbbär-accuh*
1.	**pl.**		*ənnə-säbər*	*säbbär-n*

If we assign features to the single affixes, it becomes clear that imperfective agreement markers specified for person precede the stem while all other agreement markers (number, gender and all perfective agreement affixes) follow the stem:[5]

[5] *tə-* is analyzed here as a default person marker ([+per]) because it surfaces in singular and plural forms and two of three persons. Depending on the exact analysis, it might also be assigned the feature [-1].

(7) Amharic Agreement Markers

Imperfect		Perfect	
yə-	[+per +3]	*-ä*	[+per +3]
tə-	[+per]	*-äcc*	[+per +3 +sg +fem]
ə-	[+per +1 +sg]	*-h*	[+per +2 +sg +masc]
ənnə-	[+per +1 +pl]	*-sh*	[+per +2 +sg +fem]
-i	[+fem]	*-hu*	[+per +1 +sg]
-u	[+pl]	*-accuh*	[+per +2 +pl]
		-n	[+per +1 +pl]

Again, in the DMM there is no way to express the observation that the type of information a affix expresses determines its affixal status. That systematicity in affixal status is not an accidental property of Albanian and Amharic can be seen from results by Siewierska (1993:70) who finds that tense and agreement affixes behave uniformly w.r.t affixal status in most languages. Only 5% of the languages exhibit Tense morphemes on both sides of the stem and only 13 % of them do so for agreement:

(8) The relationship between the form of SAgr and Tense affix

N=262	Tense suff N=188	Tense pref N=60	Tense both N=14(5%)
SAgr suff N=112	102 91%	9 8%	1 1%
SAgr pref N=116	68 57%	41 35%	7 6%
SAgr both N=34(13%)	18 53%	10 29%	6 18%

Note that Amharic would count for Siewierska as a language with agreement prefixes *and* suffixes even if the type of agreement marking determines its position. Thus, taking the differences between different subtypes of Tense and Agreement into account, the percentage of languages with markers "of the same type" occurring on different sides of the verb stem would probably even be lower.

Crosslinguistic Systematicity

Even crosslinguistically, there are strong tendencies for systematicity in affixal status. Thus, as Hawkins and Gilligans (1988) show, most affix types have a strong tendency to appear suffixally. For example, there are virtually no case *prefixes* (Cutler et al., 1985). The DMM, on the other hand, would lead us to expect that prefixes and suffixes are equally possible for all affix types.

Another aspect of systematicity emerges if we look at possible affix combinations: Under the DMM, for two affix types T_1 and T_2 the two orders $T_1 >$ Stem $> T_2$ and $T_1 >$ Stem $> T_2$ should both be well-documented since both can express the same underlying configurations. But again, there are strong universal tendencies in ordering: Siewierska (1993) finds that the order SAgr Stem Tense is well-documented while the order Tense Stem SAgr is only found marginally. Julien (2000) shows that Tense and Aspect – if both are suffixes or both are prefixes – exhibit the ordering patterns expected under the DMM under the assumption that Tense is located higher in the phrase structure than Aspect:

(9)

	both prefixes	both suffixes
T > A	Tense Aspect Verb	*Verb Tense Aspect
A > T	*Aspect Tense Verb	Verb Aspect Tense

However, according to Julien (ibid.), affix order is also restricted if

Tense and Aspect have different affixal status. Thus, there are clear examples of the order Tense Verb Aspect while the reverse order, Aspect Verb Tense, is virtually non-existent. Such restrictions are again unexpected under the DMM.

Uniformity of Single Affixes

Apart from what has been said up to this point, there is one restrictive aspect of the DMM regarding affixal status: It predicts that one and the same affix should always occur as a prefix *or* as a suffix but should not have both options. For example, Georgian *v-*, if specified as a prefix, could never appear after the stem, as indeed is the case. While this is an interesting prediction, it is probably too strong since there are cases of affixes that *have* different positions w.r.t. the stem in different contexts. One such case is the Fula 1sg affix *mi* (Arnott, 1970:191-192), which appears as a prefix in the general past but as a suffix in the relative past:

(10) a. ***mi-****loot-ii* ‘I washed (General Past)’
S1s-wash-GPast

b. *loot-u-****mi*** ‘I washed (Relative Past)’
wash-RPast-S1s

Noyer (1993a:69), discussing cases where affix position is determined by morphophonological factors, proposes that affixes might be underspecified for affixal status. But while relaxing the DMM in this way is halfways to a solution of "mobile affixes" as in (10), this means to give up the the only prediction the DMM makes for affixal status: that it is constant for a given affix. By the way, the fact that single affixes behave uniformly in this respect in most cases and languages can be seen as a special case of the tendency for single affix *types* to behave uniformly: As a single affix is maximally similar to itself, it is plausible that here uniformity in affixal status should be strongest. Thus what seems to be needed is a *violable* preference for uniformity in affixal status for similar affixes, not an *unviolable* ban on mobile affixes, as is implied by the DMM.

5.2.2 (Non-)Cyclicity

Recall that in DM spell-out is cyclic, i.e. it starts from the innermost element and moves outward, spelling out the parts of a complex head item by item. In this section, I argue that spell-out cannot happen cyclically in this sense. The first argument for this claim is that given two heads H_1 and H_2 in a language we can find evidence for the spell-out order H_1 H_2 as well as for the order H_2 H_1. Second, there are generalizations on affix order across languages which do not conform to cyclicity. Since cyclicity is a crucial part of the DMM, this means again evidence against this model.

Language-Internal Evidence

In many languages, inflectional affixes are not (or only partially) ordered according to the hierarchical relation between the syntactic heads they reflect but according to other criteria. For example in Menominee, the position of agreement affixes is restricted only by the person and number features they express, not by the underlying grammatical roles. Thus, -*w* marks a 3rd person subject in (11a), but a 3rd person object in (11b), while -*enaw* marks a 1pl object in (11a), but a 1pl subject in (11b). Nonetheless, the relative order of these affixes is identical in both forms:

(11) a. *ne-na·n-ek-w-enaw (nena·nekonaw)*
1-fetch-D-3-1pl
'he fetches us (exc.)' (p. 154)

b. *ne-na·n-a·-w-enaw (nena·no·naw)*
1-fetch-D-3-1pl
'we (exc.) fetch him' (p.152)

The problematic point for the DMM is the following: If in (11a) *-w* spells out subject agreement and *-enaw* object agreement, this means that subject agreement is spelled out before object agreement. However in (11b), we come to the opposite conclusion.

A related point is discontinuous spell-out. Thus if we put the 3rd person argument in (11a) into the plural, the 1st person plural affix *-enaw* interrupts spell-out of subject agreement:

(12) *ne-na·n-ek-**w**-enaw-**ak*** *(nena·nekonawak)*
1-fetch-D-3-1pl-[-1+pl]
'they fetch us (exc.)' (p. 154)

In terms of the DMM, this means that one head (SAgr) is realized partly *outside* and partly *inside* another head (OAgr). Again this violates cyclicity. There are two escape hatches in derivational DM: The first is to assume additional mechanisms which adjust the order of affixes after spell-out. These mechanisms will be discussed in section 5.2.3. The second possibility is to assume that in such cases we do not deal with discontinuous spell-out, but with multiple (agreement) heads – spelled out cyclically. Thus, Halle and Marantz (1993) assume for Potawatomi – closely related to Menominee – that affixes such as *-enaw* and *-ak* belong to different agreement heads. This proposal however faces two problems: It introduces the need for non-standard agreement categories in addition to the familiar SAgr and OAgr, and it does not allow us to express the fact that features in discontinuous agreement are normally expressed non-redundantly. For example in Dumi, the features [+1] and [+pl] are in some cases expressed by affixes preceding tense and in some cases by affixes following tense, but never in both positions at the same time:

(13) a. *phɨk-**ɨ-t**-a* ‘we (exc.) get up’
get:up-[**+1+pl**]-NPast-[-dual]

b. *phɨk-t-ə* ‘I get up’
get:up-NPast-[+1+sg]

c. *a-phɨk-ini* ‘you (pl.) arise’ (p. 96)
D-get:up-[-1+pl]

Thus if we have here two distinct agreement heads, they both agree with the subject in person and number. But then both heads are identical, and we would expect that the same items are inserted. The most natural account is to assume *one* head spelled-out discontinuously, whose features can be realized only once. In Warlpiri and Somali, the complementarity of features in different positions takes the form of *discontinuous bleeding*, i.e. “realization of a feature at one position prevents (bleeds) its realization at another position (Noyer, 1992:68)[6]. In Warlpiri, there is a first person suffix *-ṇa* and a dual affix *-pala*. The first appears before (14a), the second after all sg object suffixes (14b):

(14) a. *ŋanimpa-ḷu ka-**ṇa**-ŋku-lu njuntu nja-nji*
we-ERG PRS-1-2-PL you see-NPast
'we (pl. exc.) see you (sg.)' (p. 328)

b. *njumpala-ḷu ka-npa-ntju-**pala** ŋatju nja-nji*
you-ERG PRS-2-1-DU me see-NPast
'you (du.) see me' (p. 328)

However, the first person dual is marked by a portmanteau affix expressing dual *and* first person appearing before object marking:

(15) *ŋanimpa-ḷu ka-**ḷitjara**-ŋku njuntu nja-nji*
we-ERG pres-1du-2 you see-NPast
'we (du. exc.) see you (sg.)' (p. 328)

If there are two subject agreement heads in (14), and the head appearing after object marking in (14a) reflects number, it remains un-

[6] In the DMM, the person-number splitting in Amharic (see (6)) – similar cases are Muna and Georgian (6.2.4) – does not necessarily involve discontinuous spell-out since an agreement prefix could be spelled-out immediately after a suffix (or vice versa). Nevertheless, these cases give support to discontinuous bleeding and hence – for theoretical parsimonity – against multiple agreement heads.

explained why ***-pala*** is blocked in (15).

In Somali, person is normally marked before aspect and number after it:

(16) *keen-**t**-aa-**n*** 'you (pl.) bring'
bring-2-PRS-PL

However in the 1st person plural, there is again a 1pl portmanteau[7] before aspect, bleeding number marking:

(17) *keen-**n**-aa* 'we bring'
bring-1pl-PRS

As with other cases of discontinuous bleeding, it is *possible* to account for the data without assuming discontinuous spell-out. For example for Warlpiri, we could assume that the head spelled out *-pala* is impoverished in the 1st person dual, and that ***-ḷitjara*** expresses only 1st person, restricted by a context restriction to dual, but under this approach the complementarity of affix realization becomes completely accidental.

[7]Note that Somali agreement affixes seem to be restricted to single alveolar consonants, which leads to a great deal of homophony.

Crosslinguistic Evidence

A second problem with cyclicity is that it does not allow to derive certain crosslinguistic generalizations about affix order. Thus, as will be shown in chapter 6, (subject) person affixes in most languages precede number affixes, i.e. we find the following pattern:

(18)

	both prefixes	Mixed	both suffixes
P > N	Person Number V	Person V Number	V Person Number
N > P	*Number Person V	*Number V Person	*V Number Person

In standard DM, these patterns might be derived through fission or, again, by assuming two agreement heads. The first possibility will be discussed in 5.2.3. Under the second approach, the only way to explain the ordering generalization would be to assume that $\mathrm{Agr}_{\mathrm{Num}}$ and Agr_{Per} have fixed positions in a universal sentence structure. But no matter whether we assume person or number to be higher, this leads to a mirror-image generalization (V Aff_1 Aff_2 $\Leftrightarrow$ V Aff_2 Aff_1), not to one where Aff_1 is always on the same side of Aff_2. None of the patterns in (19) corresponds to (18a)

(19) a. **Person higher:** Person Number V V Number Person
b. **Number higher:** Number Person V V Person Number

Moreover, again no prediction is made about the order of affixes if one is a prefix and the other a suffix. Thus, the overall picture is that cyclicity is is, on the one hand, too strong to account for discontinuous bleeding, but also too weak to account for certain generalizations, such as the ordering of person and number affixes.

5.2.3 Additional DM Devices do not Save the DMM

Feature-Driven Vocabulary Insertion

Noyer (1992:261 ff.) proposes that for agreement morphology in certain languages a hierarchy of features determines the linear ordering of affixes. He formulates this as part of his "Feature Hierarchy Hypothesis" (p. 263):

(20) **Feature Hierarchy Hypothesis**
There is a universal hierarchy of morphosyntactic features . If F and G are morphosyntactic features and F is higher than G on the hierarchy, then...
If two spell-out rules, one referring to F, the other to G and not to F, have disjoint or overlapping structural descriptions,

> then the rule referring to F applies first. Corollary . . . An affix realizing F will appear more embedded than an affix realizing G but not F.

This complements and partly replaces cyclicity based on syntactic structure. However, the generalization in (20), while superseding one type of cyclicity, just creates another one. Thus assuming the feature hierarchy PER $\gg$ NUM, this will lead to the orders in (19a), while NUM $\gg$ PER results in (19b).

Lowering and Local Dislocation

In derivational DM there are certain morphological operations influencing the linear order of VIs. I will refer in my discussion here to the most elaborated presentation of such operations, which is given in Embick and Noyer (1998). The authors distinguish two types of operations, *Lowering* and *Local Dislocation*.

In *Lowering* a head of an XP adjoins to the head of its complement (ibid:269). Lowering takes place before vocabulary insertion, hence before linearization. This means that Lowering does not have to say anything about affixal status, which is fixed during linearization nor can it refer to entities that are only created at vocabulary insertion, such as person and number VIs, which derive from a single syntactic head. Hence, no ordering asymmetry of affixes on different sides of the stem nor any generalization about person and number affixes can be captured.

More promising seems the operation *Local Dislocation* (LD) which applies after Linearization and can metathesize linearly adjacent VIs. This looks like an appropriate means to account for cases of discontinuous spell-out as in Warlpiri, where Hale (1973) proposes to account for the data presented in 5.2.2 by a metathesis rule of this type. Here this analysis is also supported by the fact that spell-out of subject agreement is not discontinuous when object affixes are plural:

(21) *njumpala-ḷu ka-n(pa)-pala-tjana wawiri-patu nja-nji*
you-ERG PRS-2-DU-3pl kangaroo-PAUC see-NPast
'you (du.) see the several kangaroos' (p. 329)

However, an analysis in these terms would be less plausible and more complex in languages where no such alternation is found, as in Menominee. Here, we find forms where the markers of subject agreement, such as -*w* and -*ak* in (22), are separated from each other by more than one item:

(22) *pia**-w**-Esa-Epani**-ak*** *(piasapanik)*
come-[+3]-PRS-PRET-[+3+pl]
'so they are coming' (p. 108)

Actually, *-ni* which appears after the otherwise found forms *-Esa or -Epani* in specific contexts, might also be a separate item, and in transitive verb forms further plural agreement can appear before *-Esa*. To derive the correct order of *-w* and *-ak*, we would then have to apply 3 or 4 metathesis operations. Assuming the possibility of multiple metathesis, it is possible to derive virtually any affix order from a given other order. Contrary to this, only very specific cases of discontinuous spell-out seem to occur. Especially, the cases discussed here all involve the rightward "movement" of a number affix while an analogue leftward dislocation seems to be excluded. But it is difficult to see how local dislocation rules could be restricted in a general way to move certain affixes in a specified direction.

By its very conception as a means to readjust affix order given by cyclic spell-out under specific conditions, LD seems to be the wrong instrument to account for general affix order facts. If it is true that Tense generally cannot be a suffix when Aspect is a prefix (cf. 5.2.1), a model which assigns first arbitrary affixal status to both to rearrange them then in case the order is "wrong" would be rather bizarre. Again, such a reordering would involve multiple LD rules. Similar arguments can be made for the generalizations on person and number affixes which were discussed above.

Templates

Templates (Bonet, 1991) are a third means in DM to account for affix order. For example, we could assume for Amharic a template like (23) which would obviate the need for stating affixal status for each affix separately:

(23) Template for Amharic Agreement Affixes

$$\begin{bmatrix} Asp & Impf \\ per & \alpha \\ (num & pl) \end{bmatrix} \; \mathrm{V} \; \begin{matrix} \begin{bmatrix} Asp & Perf \\ (per & \alpha) \\ (num & pl) \\ (gend & fem) \end{bmatrix} \\ \begin{bmatrix} Asp & Impf \\ num & pl \end{bmatrix} \\ \begin{bmatrix} Asp & Impf \\ gend & fem \end{bmatrix} \end{matrix}$$

However, there are also serious problems with morphological templates: First, templates are a very unrestrictive device. Using templates, one can stipulate any conceivable affix order – as long as there is a finite number of possible affix combinations. Second, templates do not offer a unified solution to the ordering of aspect and tense (see 5.2.1). We can state templates like Tense V Aspect or Verb Aspect Tense but these templates would not have any systematic connection between each other. Third, there are many cases where templates do not allow a concise statement of affix order facts, while violable constraints on morpheme order do. One such case involving Italian clitics was already discussed[8] in 4.3.2. Here a second example follows:

Verbs in Nahuatl (Andrews, 1975) agree with up to three non-external arguments.[9] As in Menominee, the linear order of the agreement prefixes cannot be determined by cyclic spell-out, as is shown by the following examples(Andrews, 1975:98):

(24) a. *ti-**nēch-tē**-maquīl-tia*
S2s-O1s-[+an-def+Obj]-give-CAUS
'you persuade me to give it to someone'

b. ***nēch-tē**-maquīl-tia*
O1s-[+an-def+Obj]-give-CAUS
'he persuades someone to give it to me'

[8]The problems discussed there and for Nahuatl also carry over to the Amharic template in (23). An account for Amharic affix order in terms of DO constraints is given in 6.2.6.

[9]Subject agreement is marked in a way that does not crucially interact with the phenomena discussed here.

In (24a), *tē-* marks the indirect object of the embedded predicate in (24a) and *nēch-* the direct object of the matrix predicate. In (24b), the situation is reversed. Nonetheless, the order of the affixes is in both forms *nēch-tē-*.

Andrews (1975:42) illustrates the order of Nahuatl object affixes by the following (slightly simplified) template:[10]

(25)

I	II	III	IV
Specific	Reflexive	Nonspecific & Human	Nonspecific & Nonhuman

This template is inadequate in several respects: First, it remains an accident that no affix can show up in more than one position. For example, if we would replace the specification of template position III in (25) ("Nonspecific & Human") by "Human" alone, specific human agreement markers could appear either in the first or the third template position. Introducing this unattested variation in affix order would not even make the template more complex but simpler than (25). Second, the obvious generalizations that – everything else equal – specific affixes always precede non-specific ones (26) and human ones always precede non-human ones (27) remain un-expressed. These effects are captured

[10] Andrews uses the template only for expository purposes.

in each case by two specifications in different template positions (I and III, and III and IV, respectively).

(26) **Specific (nonreflexive) before Non-Specific: [+spec -ref] $\gg$ X**

a. *qui-* [+spec +3 +sg -ref +hum]- *tē- (qui+tē)* [-spec +3 +sg -ref +hum]
to:him-someone

b. *qui-* [+spec +3 +sg -ref +hum]- *tē- (qui+tē)* [-spec +3 +sg -ref +hum]
him-to:someone

(27) **Human before Nonhuman: [+hum] $\gg$ [-hum]**

a. *tē-* [-spec +3 +sg -ref +hum]- *tla- (tē+tla)* [-spec +3 +sg -ref -hum]-
to:someone-something

b. *tē-* [-spec +3 +sg -ref +hum]- *tla- (tē+tla)* [-spec +3 +sg -ref -hum]-
to:something-someone

Finally, there are also technical problems: Template positions are usually assumed to license only single morphemes (Bonet, 1991:102 ff.). This holds true in Nahuatl for the first two position in (25)[11] but not for the third and fourth, as illustrated in (28) where we have two un-

[11]See section 3.3.1 for discussion.

specific object affixes:

(28)	*tē-*	*tē- (tē-+tē)*
	[-spec +3 +sg -ref +hum]	[-spec +3 +sg -ref +hum]
	to:someone-someone	

Of course, we could multiply template positions and assume, say, three positions for Nonspecific/Human and Nonspecific/Nonhuman each,[12] but this would only further highlight the ad-hoc nature of such templates.

Campbell and Karttunen (1991) attribute the ordering of prefixes to the following "principles ... which must apply in the order given" (ibid:171)

(29) (1) specific before everything else
(2) reflexive before nonspecific
(3) human before nonhuman

This obviously amounts to taking the generalizations illustrated in (26) and (27) and an analogous restriction on reflexive affixes (30) as constraints that are ranked in an OT-manner.

[12]The descriptive literature reports not more than 3 indefinite affixes together, but it is unclear if constructions as multiple causatives cannot induce even more object affixes.

(30) **Reflexive before Nonspecific: [+ref] $\gg$ [-spec]**

a. *mo-* *tē (mo+tē)*
[+spec +3 +sg +ref +hum]- [-spec +3 +sg -ref +hum]
to:himself-someone

b. *mo-* *tē (mo+tē)*
[+spec +3 +sg +ref +hum]- [-spec +3 +sg -ref +hum]
himself-to:someone

The effects of ranking are illustrated in the following examples. The priority of the specificity constraint over the [+human]-Constraint is illustrated in (31). In (32) it is shown how the correct order *(qui+tē)* follows from the constraint ranking.

(31) **(26) [+spec -ref] $\gg$ X vs. (30) [+hum] $\gg$ [-hum]**

a. *qui-* *tē- (qui+tē)*
[+spec +3 +sg -ref -hum]- [-spec +3 +sg -ref +hum]
to:it-someone

b. *qui-* *tē- (qui+tē)*
[+spec +3 +sg -ref -hum]- [-spec +3 +sg -ref +hum]
it-to:someone

(32)

(qui+tē)	[+spec -ref] ≫ X	[+ref] ≫ [-spec]	[+hum]≫ [-hum]
☞ qui-tē			*
tē-qui	*!		

(33) exemplifies the preference of the reflexivity constraint over the [+human]-constraint. (34) contains the corresponding OT tableaux:

(33) **(30) [+ref] ≫ [-spec] vs. (27) [+hum] ≫ [-hum]**

a. *mo-* [+spec +3 +sg +ref -hum]- *tē- (mo+tē)* [-spec +3 +sg -ref +hum]-
to:itself-someone

b. *ne-* [+spec +3 +sg +ref -hum]- *tē (mo+tē)* [-spec +3 +sg -ref +hum]-
itself-to:someone

(34)

(mo+tē)	[+spec -ref] ≫ X	[+ref] ≫ [-spec]	[+hum]≫ [-hum]
☞ mo-tē			*
tē-mo		*!	

Actually, (29) can be further simplified as follows:

(35) (1) L ⇦ [+specific]

(2) L ⇦ [+refl]

(3) L ⇦ [+hum]

The constraint (2) can be underspecified in this way since the higher-ranked (1) already ensures that reflexives show up after specifics. Of course, constraints of this type also require that human referents precede human referents. Thus, the expression of agreement for to:someone-someone *tē+tē* will induce a constraint violation. This however is unproblematic, since there is no more optimal candidate realizing both morphemes.[13] None of the problems which were faced with the template approach carries over to the solution with constraint ranking. Multiple instances of single positions are in principle possible. Since each feature induces an positional asymmetry, no ranking will allow the occurrence of single VIs in different positions. The generalizations unexpressed in the template are stated in a transparent way. Finally, the OT-solution is not a stipulative addendum for the theory. Alignment Constraints are independently motivated for the description of infixes and many other phonological phenomena (Prince and Smolensky, 1993).

Replacing templates by ranked constraints can be seen as a elaboration of the proposal by Noyer (1992:263 ff.) to construct templates

[13] Of course, if mirroring – which is responsible for the realization of identical VIs – is ranked lower than (3), this would result in the restriction of [+human] affixes to one instance.

from "different ordering statements". Thus, he proposes to account for the ordering of the Dakota agreement affixes in (36) by the ordering statements in (37):

(36)

	3rd person >	1st person >	2nd person	
a.	*wić^{h}a*	*wa*		1:3pl
b.	*wić^{h}a*	*ũk*		1pl:3pl
c.	*wić^{h}a*		*ya*	2:3pl
d.		*ma*	*ya*	2:1
e.		*ũk*	*ya*	2:1pl
f.		*ũk*	*ni*	1pl:2

(37) a. patient > agent
b. [+I] > [+you]

Since Noyer assumes that *ũk* is underspecified for case (i.e. agent or patient), (37a) is irrelevant for the order of *ũk*, and – due to (37b) – it always precedes the 2nd person markers (36e,f). On the other side, (37a) is satisfied vacuously in all orders involving a 3rd person marker. Hence, (37a) fixes the positions correctly for (36a,b,c). Noyer regards this account as superior to the one by Schwartz (1979) which simply assumes a template of the form 3 > 1 > 2 and a more traditional account that assumes a basic order Patient > agent and an exception statement for the aberrant case *ũk ni* (36f), where the order is reversed.

However, both the approach of Schwartz and Noyer are seriously flawed by the fact that there are data where 1st person follow second person markers. This is the case in the so-called deponent verbs where both arguments of a transitive verb are realized by patient markers (Miner, 1980):

(38)	*iye-ni-ma-čheča* V-2sg-1sg-V	'I resemble you'

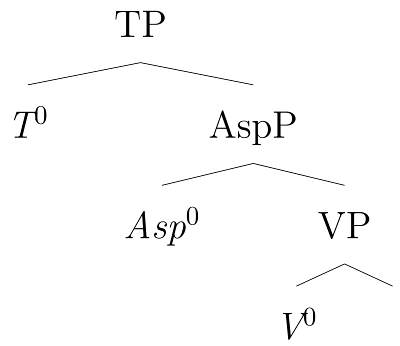
While this can be accounted more or less in the traditional view, because the lower argument if not the patient argument is marked first, it contradicts the claim inherent in the other approaches: that 1st person markers always precede 2nd person markers. I interpret this as further evidence that the reconstruction of templates should resort to non-monotonic devices as ranked violable constraints. An account of the Dakota data along these lines will be presented in 6.2.5.

5.3 Antisymmetric Accounts of Affix Order

A radical alternative to the DMM is developed as part of Kayne's (1994) antisymmetry of syntax and developed further in Cinque (1999) and Julien (2000). I will refer in my discussion to the most worked-out account of affix order that by Julien (2000). The basic assumption of the antisymmetric approaches is that all linear ordering is determined uniquely by the hierarchical configurations of syntax. This means that in affix order something like affixal status has no place.

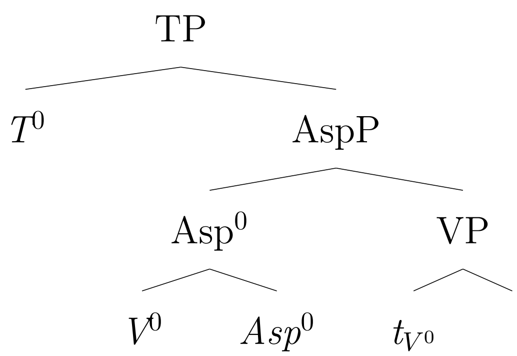
Julien (2000) starts from the observation that there are 6 logical orders of T(ense), A(spect) and (V)erb root, but only 3 that actually occur, namely T A V, V A T and T V A. This is shown to follow from the independently motivated antisymmetric framework of Kayne (1994), where a universally uniform Specifier-Head-Complement structure and the restriction of movement to leftwards movement is assumed. Under this approach, there are four possible situation where T, A, and V can become adjacent. In the base-generated order, all affixes stay in the positions where they are generated without movement. This gives the order T A V:

(39) The base-generated order



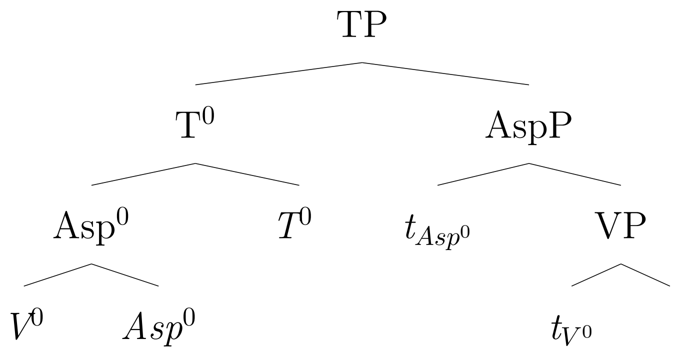
If the verb head-moves up to Asp^0, the order T V A results:

(40) Movement of V^0 to Asp^0



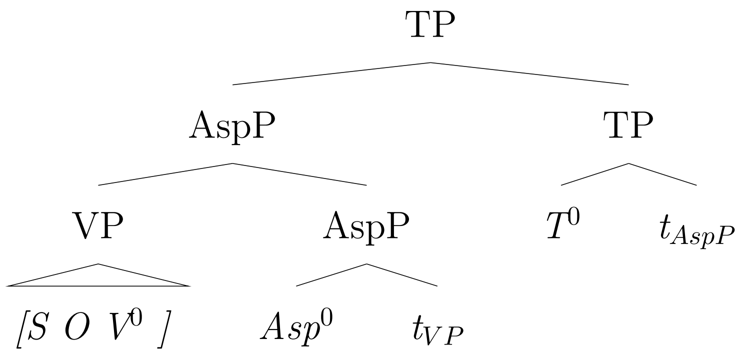
Further movement of the complex [V A] to T^0 leads to a standard head-movement pattern:

(41) The head-movement order



While these options suffice to derive the three occurring patterns, a fourth scenario is necessary to account for the frequent appearance of suffixes in verb-final languages, which can hardly be the result of moving the head to V, resulting in a sentence-medial position of the verb. Julien (ibid:chapter 4) shows convincingly that in this language type the dominant pattern is movement of the complements to the specifiers of functional heads. Thus, in (42) the VP – including all complements – has moved to the specifier of Asp^0. Subsequently, the Aspect Phrase has moved to the specifier of TP, as in (42).

(42) Movement of complement to Spec



Note that under Julien's approach there is no unique structural equivalent of the morphosyntactic word. Thus in a sense, words do not exist:

(43) . . . "if a given string of morphemes is regarded as a word, it simply means that the morphemes in question regularly appear adjacent to each other and in a certain order. The reasons why the morphemes show such behavior is to be found in their syntax. But notably, the structural relation between the morphemes is not directly relevant for the word status of the string, it only matters insofar as some structural arrangements of morphemes may result in independent distribution and internal cohesion whereas others may not." (p. 38)

5.3.1 Deriving Affixal Status

Affixal status in the antisymmetric approach is not the result of idiosyncratic specifications but results directly from syntactic movement. Thus the fact that Tense is a prefix in(39) and (40) but a suffix in (41) results from the movement of the verb to the left of Tense in the latter but not in the former cases. Assuming that the syntactic inflectional heads behave uniformly w.r.t. movement properties (e.g. Albanian imperfect tense attracts the Verb iff aorist tense does, cf. (5)), this predicts that affixes of the same type should have the same affixal status. Syntax is also the basis to account for crosslinguistic preferences in affix order. Thus, Julien observes that preposed and postposed tense markers are rather evenly distributed in verb-initial and verb-medial languages, but postposed markers are much more frequent in verb-final languages, as shown by the table in (44).[14] The numbers refer to language genera in the sense of Dryer (1992):

[14]Note that Julien also includes non-bound tense markers, since for her there is no substantial difference between affixes and free elements.

(44) Position of tense marker relative to word order (Julien, 2000:339)

	Preposed	Postposed	Genera
V-initial	24 67 %	19 51 %	36
V-medial	66 65 %	67 66 %	101
V-final	34 25 %	127 66 %	138

Because in verb-initial and verb-medial languages most arguments remain relatively low in the clause, the affixal status of tense only depends on how high the verb has head-moved. Prefixes and suffixes should therefore be rather evenly distributed. On the other hand, head-final languages, according to Julien, are normally derived by the pattern in (42), which results in suffixation of Tense.

Finally, the fact that the order Tense V Aspect is possible while *Aspect V Tense is not, results from the assumption that Tense is higher in the sentence than Aspect. To derive the offending order, V would have to move to Tense to get [V Tense], but then Aspect cannot be further on the left, i.e. structurally higher than this complex. The antisymmetric account hence avoids most problems that were observed with affixal status in 5.2.1.

5.3.2 The Status of Agreement

What remains problematic – even under the antisymmetric approach – are the cases of non-cyclicity. Julien assumes that discontinuous agreement is the result of multiple agreement heads (ibid:367 ff.) which leads to the problems already discussed in 5.2.2.

The standard position of agreement however according to her seems to be adjoined to a head Fin^0 ("Finite") present in finite predications that is higher in the tree than Tense. This explains that the orders SAgr V Tense and V Tense SAgr are relatively frequent (see chapter 6) but leaves it as a mystery that SAgr in prefixal position more often follows than precedes Tense. Finally, the asymmetry between person and number marking cannot be captured by the mechanisms Julien uses to account for aspect and tense. I illustrate this point in (45). Again, to get a syntactic account, we would have to assume that Person is either the higher (H) or the lower (L) head, where under one of these assumptions (person higher: P $\ggg$ N, number higher: N $\ggg$ P) affix ordering should pattern with the order of A(spect) and T(ense). Note that "$X \ggg Y$" means that X is syntactically higher than Y while "$X > Y$" means that X precedes Y in linear affix order:

(45)

	Prefixal		Suffixal		Mixed	
	H>L	L>H	H>L	L>H	H>L	L>H
$A \ggg T$	*	T>A>V	V>A>T	*	T>V>A	*
$P \ggg N$	P>N>V	*	V>P>N	*	P>V>N	*
$N \ggg P$	*	P>N>V	*	V>P>N	*	P>V>N

This however is not the case – due to the fact that the position of person and number markers in suffixal position does not mirror that in prefixal one an the antisymmetric account as the DMM always predicts mirroring in these cases.

Note however that all the observed problems are restricted to agreement. Indeed, Julien assumes that agreement differs from the other inflectional heads in that it is added after syntax to different existing heads. The account developed in chapter 6 can be seen as a further development of this basic idea.

5.4 Further Variations on Dash and Mirror

5.4.1 Lexicalist Dash and Mirror

Lexicalism in its strongest form implies that all morphological information is coded in the lexical entries of single affixes. This extreme form does not make any interesting predictions about affix order (cf. 2.1.1). Minimalist Morphology (Wunderlich and Fabri, 1994) proposes instead that a lexicalist morphology be enriched constraining affix order by reference to the hierarchy:

(46) C > person > number > gender > mood > tense > aspect > voice (> verb) (Wunderlich and Fabri, 1994:247)

Affix Order is now determined "in the unmarked case"[15] by the condition in (47):

(47) **Affix Order**

The order of affixes must conform to the hierarchy, i.e. no affix can be attached if it expresses a category that is lower ranked than any of those already instantiated. (p. 249)

[15] This might be overridden by language specific constraints or specifications of single affixes.

Since affixal status is as in the DMM marked idiosyncratically on single affixes, this approach makes the same predictions w.r.t. affix order as the proposal for feature-driven spell-out discussed in 5.2.3. Therefore, I will only make some notes on the empirical basis of this approach:

Wunderlich refers in this respect to Bybee (1985) who claims the validity of basically the same hierarchy as in (46) w.r.t. affix order on the basis of a crosslinguistic study of 50 languages. As far as the order of person and number is concerned, Bybee did not test the relative order of such affixes " because in a large majority of languages these [number] markers occur in a portmanteau expression with person markers." (ibid:35). For the relative order of SAgr and Tense, Bybee did test the order in her sample and found that Tense markers occur closer to the stem than person markers in the large majority of languages. This result is also replicated in my data (see chapter 6), especially for languages where Tense and Agreement are both suffixal. However the opposite is true if both are prefixes. Bybee's result therefore is crucially based on the fact that suffixes are much more common than prefixes. In other words, taking a language where Tense and SAgr are prefixes, lexicalist DMM makes the wrong predictions.

Thus, the data examined by Bybee do not lend crucial support to the MM version of mirroring.

5.4.2 Affixless Dash and Mirror

In section 2.1.3, it was pointed out that affixless theories have problems to account for systematicity in affix order for affixes that are underspecified for case and for affixes that can surface both as suffixes and prefixes. Stump (1992, 1993a) develops an enriched version of a word-and-paradigm model that tries to resolve these problems. One additional device he introduces is the traditional notion of position class to which morphological rules can explicitly refer. Here are two examples of such rules which introduce Swahili agreement affixes specified for case (Stump, 1993a:136). MLR stands for "Morpholexical Rule". The subscripts specify the position class that is targeted and the features that trigger the rule. On the right side of "$=_{def}$", the operation carried out by the rule is specified.

(48) a. $\mathrm{MLR}_{I:[AGR(ob):2sg]} =_{def} [_V\ ku\ [_V\ x]]$
b. $\mathrm{MLR}_{IV:[AGR(sub):2sg]} =_{def} [_V\ u\ [_V\ x]]$

The first rule prefixes *ku-* in position class I if the object is 2sg and of gender *wa*. The second rule does the same with *u-* for the corresponding subject features. Each rule explicitly specifies whether it effects prefixation or suffixation and in which position class it applies. Position classes are conceived cyclically, i.e position class IV in (48) does not strictly precede class I it is *outside* of I. If (48) is modified to yield suffixes instead of prefixes as in (49), we get *V-ku-u* instead of *u-ku-V*

(49) a. $\mathrm{MLR}_{I:[AGR(ob):2sg]} =_{def} [_V\ [_V\ x]\ ku]$

b. $\mathrm{MLR}_{IV:[AGR(sub):2sg]} =_{def} [_V\ [_V\ x]\ u]$

Since for each affix there is an explicit statement about its affixal status and position classes are cyclic, this model could be called "Affixless Dash and Mirror". Let us see now how it copes with the problems we found for Amorphous Morphology. For Swahili agreement affixes not marked for case Stump assumes rules like the following (ibid:146):

(50) a. $\mathrm{MLR}_{g(\mu):[AGR(\mu):1sg]} =_{def} [_V\ ni\ [_V\ x]]$

b. $\mathrm{MLR}_{g(\mu):[AGR(\mu):3pl]} =_{def} [_V\ wa\ [_V\ x]]$

where g is the function $\{ < su, IV >, < ob, I > \}$. The rules are now effectively parameterized: Position I correlates with sub(ject) expression and position IV with ob(ject) agreement. While this formally obviates the argument that an affixless account has to stipulate two rules for *ni-* and *wa-*, this analysis seems hardly much better than one in the system of Anderson. Thus, the case-less affixes cannot be subsumed under the schemata for subject and object agreement, but a third scheme has to be used. That this is rather stipulative can be seen from the fact that the function g could just as well be reversed to get $\{< ob, IV >, < su, I >\}$ which would mean that for the caseless affixes order in Swahili would be Obj > Sub while it is Subj > Obj for all other affixes, clearly a counterintuitive result. This also points at a deeper problem with this approach: Position class has to be stipulated for each single affix, which excludes stating language particular as well as crosslinguistic constraints on affix order even to the degree of the DMM in its DM version.

5.5 OT-Approaches to Affix Order

5.5.1 Affix-Specific Alignment

The earliest account for affix order in OT-terms is probably that of Prince and Smolensky (1993) which use alignment constraints to describe the position of affixes. For example, the position of a prefix such as Georgian *v-* would be subject to the morpheme-specific constraint

(51) Align($[\text{v}]_{Affix}$], Left, Stem, Left)

which means that the left edge of *v-* should be as near as possible to the left edge of the stem, i.e. of the constituent formed by the root and the prefix. This constraint can be partially violated by constraints on phonological well-formedness thus leading e.g. to infixation. The assumption of morpheme-specific constraints of this type of course is again a highly stipulative means that does not allow to formulate any morphological generalization and runs counter to the general spirit of OT, where constraints are generally assumed to be universal. From the context of its formulation, it is of course clear that it is not thought as a serious proposal about universal morphology, but as a preliminary device to model the interaction of morphology and phonology in a constraint-based grammar. From this point of view, it is clear that it also suffers several other shortcomings. For example, the Swahili data cannot be described since morpheme-specific alignment cannot refer to underlying morphosyntactic features.

5.5.2 Optimality and Mirroring: Potter (1996)

Potter (1996) observes that affix order in Athabaskan seems reversed to that of the Bantu language Siswati, thus causing problems for a straightforward interpretation of the mirror principle of Baker (1985):

(52) a. **Athabaskan:** Agr_{Obj} Aspect Agr_{Subj} Root

b. **Siswati:** Agr_{Subj} Aspect Agr_{Obj} Root

He proposes to resolve this problem by deriving affix order through an OT-component which fixes affix order through alignment constraints which are ordered in the same way as syntactic phrase structure:

(53) [Agr$_{Subj}$ [Aspect [Agr$_{Obj}$ VP]] $\Rightarrow$
ALIGN(Agr$_{Subj}$) $\gg$ ALIGN(Aspect) $\gg$ ALIGN(Agr$_{Obj}$)

The crucial difference between the involved languages is seen in the way "ALIGN" in (53) is defined . In Athabaskan it is defined as (54a) and in Siswsati as in (54b).

(54) a. **Athabaskan:** ALIGN(Affix, Left, Stem, Left)
b. **Siswsati:** ALIGN(Affix, Right, Root, Left)

The result is that in Siswati mirroring of the usual type occurs while in Athabaskan mirroring is, so to say, mirrored, i.e. reversed. Potter's account is in many respects very tentative. Nothing at all is said about suffixes and affixal status. Anyway, it is dubious whether the Athabaskan verb is really one syntactic unit (cf. McDonough, 1990; Cinque, 1999). Supposing that the mirror principle for suffixes is derived in essentially the same way as for prefixes, we get a version of the DMM that is further weakened: Under the DMM we have for the structure [[V T] A] the realizations V T A, A T V, A V T, and

T V A. Under Potter's approach, every permutation of A V and T is allowed [16] This seems to me exactly the wrong direction to go.

[16] This is not to say that every permutation of every sequence is allowed. Thus, A B C D Root can get A B C D Root or D C B A Root, but not A C D B Root.

Chapter 6

Subject Agreement: A Distributed Typology of Affix Order

In section 5.3.2, it was observed that the ordering of Tense w.r.t. Aspect shows different patterns compared with that of number w.r.t person agreement. More concretely, number marking always occurs to the right of person marking, independently of the position of the markers as prefixes or suffixes. There is a natural explanation for this in OT-based DM, if "split" person/number affixes are analyzed as the spell-out of syntactically simple heads: Their order cannot be determined in syntax, where they do not form separate units. Thus, their actual behavior will be accounted for by morphological constraints. Alignment constraints naturally account for the tendency of number to the right and person to the left. A similar pattern can be found for the respective order of portmanteau subject-object and simple subject agreement, where the first always precedes the latter and again a kind of fission is involved. The alignment account also extends to cases of discontinuous spell-out, which typically involves rightward movement of number affixes. This is exactly what is expected by the assumed alignment constraints, if these are also capable to determine (partly) the relative order of agreement and contentful heads such as Tense. Further constraints require that agreement heads are spelled out coherently and reflect the position of their underlying Tense host in their surface position. This ensures that agreement also reflects syntactic structure as long as these requirements are not ranked out by the introduced alignment constraints. Thus, the overall picture is roughly as in classical DM: Affix order is determined partly in syntax and partly in MS. However, the working of MS is much more restricted both in its domain and in its possible parameterizations.

In section 6.1, I will make some remarks on the language sample I use for a cross-linguistic survey to check affix generalizations not or only marginally discussed in the literature. The following sections refer the results and show how the different generalizations on affix order for subject agreement can be derived by the interaction of constraints:

- The relative order of person and number agreement (6.2)
- The relative order of direction marking and subject agreement (6.3)
- Uniformity of affixal status/systematicity in single languages (6.4)
- The relative order of subject agreement and tense (6.5)

6.1 The Language Sample

Most of the phenomena that are of interest here face the problem that they are relatively rare. This is true for:

- Subject person and number expressed by different affixes
- Direction marking
- Tense and SAgr markers which are both prefixes

Thus, the sample is intended to maximize the number of languages which exhibit these patterns, since the goal is not to test the frequency of these patterns but different properties of these patterns.

On the other hand, I tried to find instances for all patterns in as many genetically diverse language families as possible according to the classification of Ruhlen (1987).

A second problem is to differentiate subject agreement from similar grammatical markers such as cliticized pronouns. This problem is especially clear in so-called pronominal-argument-languages where agreement affixes seem to make genuine arguments of the verb superfluous. However, I assume with Baker (1990, 1996), who argues convincingly for this analysis in Mohawk, that in most of these cases the agreement markers identify empty pronominals and are not incorporated pronouns themselves.

A similar problem arises with verbal plural markers which often express verbal categories such as iterative or intensity of action, but might be taken as plural agreement in a superficial analysis (cf. Durie, 1986). Another type of such "false plurals" are incorporated quantifiers which are discussed in section 6.2.6. Such markers were not included in the language survey.

In cases of ergative systems I always took the absolutive markers as subject agreement. This is along the lines of Bok-Bennema (1991) who assumes that ERG in many Ergative languages is an oblique case.

Finally, I did not consider languages where SAgr is fused to a high degree with other categories like tense and aspect as for example in

Tonkawa (Hoijer, 1922), [1] where person and tense marking are hardly separable. According to my assumptions, such cases should uniformly show the pattern of the contentful categories, but not the pattern of subject agreement.

6.2 The Order of Subject Person and Number Agreement

6.2.1 Methodology

Apart from the relative rarity of the phenomenon, determining the relative order of subject person and number agreement faces the problem that person and number markers are often fused, i.e. number markers also specify person values or vice versa. Consider e.g. Menominee: While there are pure person markers (here: *w*- [+3]), the plural markers (-*ak* [-1 +pl]) also mark person:

(1) *po·se-w-ak* ‘they embark’
embark-[+3]-[-1+pl]

I try to solve the problem by including all cases into consideration where one agreement affix marks only one category C_1 (person or num-

[1] The effects of such fusion will be discussed w.r.t Amharic in 6.2.6 and for Choktaw in 6.5.2.

ber) while the other affix marks the other one C_2 and possibly also C_1. Thus, the pairs in (2) will count as asymmetric w.r.t. PER and NUM, while those in (3) will not:

(2) a. Aff_1 [+PER] Aff_2 [+NUM]
 b. Aff_1 [+PER +NUM] Aff_2 [+NUM]
 c. Aff_1 [+PER] Aff_2 [+PER +NUM]

(3) a. Aff_1 [+PER +NUM] Aff_2 [+PER +NUM]
 b. Aff_1 [+PER] Aff_2 [+PER]
 c. Aff_1 [+NUM] Aff_2 [+NUM]

In treating such cases, I will assign each affix in a pair as in (2), which realizes only one feature, the label P (for +PER) or N (for +NUM). The other (possibly complex) member of the pair will get the complementary label. For example, [+NUM] in (2b) will be written N, and [+PER +NUM] P. On the other hand, [+PER +NUM] in (2c) will be assigned the label N, since here it is the more number-determined affix. It should be clear that P and N in these cases are not context-independent labels, but have to be interpreted w.r.t an asymmetric pair of PER/NUM affixes. Where only pure person/number markers are considered, P and N have the more straightforward interpretation.

Linear precedence between asymmetric affixes is determined straightforwardly in cases where the asymmetric affixes cooccur as with *v-* and *-t* in Georgian:

(4) *v-xedav-t* ‘we see’
S1-see-PL

Where they cannot, precedence can be determined by the relative position of the PER/NUM affixes w.r.t a third unit. E.g. the Georgian 3pl suffix *-en* [+PER +NUM] is said to follow the 1sg prefix *v-* [+PER] since the first follows the stem and the latter precedes it, even though this never happens in the same form.

There are cases where both methods do not show any positional differences. Thus, in Amharic, the second person prefix *tə-* [+PER] is arguably not specified for number, since 2pl is expressed with the suffix *-u* But *tə-* occurs in the same position as the 1pl affix *ənnə-* [+PER +NUM] w.r.t all possible third units. Such cases will be excluded from consideration

(5) a. *tə-säbr-u* ‘you (pl.) break’
S2-break-PL

b. *ənnə-säbər* ‘we break (p. 301)
S1p-break

I try to resolve the problem of scarcity of data by including different patterns from single or closely related languages. Thus, Quechua is included twice since there are varieties with the order P > N and others with N > P (see below for discussion). Two patterns are said to be different if they involve different orders or different sub-cases of (2). Thus, Georgian involves two patterns *v-* /*-en* [+PER] > [+PER +NUM] and *v-* /*-t* [+PER] > [+NUM].

6.2.2 Results

In the language sample, there are 58 languages exhibiting splits in person/number marking. These show 78 different ordering patterns. 10 of these patterns include only prefixes, 30 only suffixes, and 40 are mixed (one is a prefix, and one is a suffix):

(6) Ordering Patterns

10	both prefix	12.5 %
30	both suffix	37.5 %
40	mixed	50.0 %

What is interesting here is that the mixed cases constitute one half of the patterns. (7) contains the relative percentages of P > N and N

> P for all patterns. Note that P > N is the dominant pattern, no matter which of both affixes is a prefix or a suffix.

(7) All Patterns

	both prefix	both suffix	mixed	all
P > N	9 90.0%	22 73.3%	39 97.5%	70 87.5%
N > P	1 10.0%	8 26.7%	1 2.5%	10 12.5%
sum	10	30	40	80

The same results also hold if we look only at the affixes marking person or number, but not both, i.e. if all patterns involving PN are excluded:

(8) Only P,N (PN excluded)

	both prefix	both suffix	mixed	all
P > N	8 88.9%	17 77.3 %	25 100%	50 89.3 %
N > P	1 11.1%	5 22.7%	0 0%	6 10.7%
sum	9	22	25	56

In (9), it is shown how far a Dash- and Mirror-Approach could account for the data. P(N) stands for "Person outside of Number", and N(P) for the converse relation.

(9) The Dash- and Mirror-Approach

	both prefix	both suffix	mixed	all
P(N)	8 88.9%	5 22.7%	– –	13 41.9%
N(P)	1 11.1%	17 77.3%	– –	18 58.1%
sum	9	22	–	31

Assuming that person always occurs outside of number leads to good results for prefixes (88.9%), but to a bad one for suffixes (22.7%). Assuming that number always occurs outside of person leads to the same problem in a mirror fashion. This is also reflected by the fact that each pattern accounts for approximately one half of the suffix/prefix data. Of course, for the mixed cases this approach does not make any predictions at all.

A possible source of error are person and number affixes which always occur adjacent. These could be actually simple affixes. Hence, the following table counts only affixes which are in some instances separated. This is always true for the mixed cases:

(10) Separated Affixes

	both prefix	both suffix	mixed	all
P > N	2 100.0%	10 66.6%	39 97.5%	51 89.5%
N > P	0 0.0%	5 33.3%	1 2.5%	6 10.5%
sum	2	15	40	57

Finally, I checked if areal factors influence the results. To this aim, I checked the different ordering distribution in the six large geographical areas of the world according to Dryer (1992):

(11) Distribution in Linguistic Macro-Areas

	NORTH AMERICA	SOUTH AMERICA	EURASIA	SE. ASIA & OCEANIA	AUSTRALIA & N. GUINEA
P>N	15 93.75%	8 88.9%	12 92.3%	5 100%	11 68.8%
N>P	1 6.25%	1 11.1%	1 7.7%	0 0%	5 31.2%
sum	16	9	13	5	16

While the PER-NUM-Asymmetry is of different strength in different areas (e.g. 68.8% in AUSTRALIA & NEW GUINEA vs. 83.3% in NORTH AMERICA), it holds in all of them. This indicates that these generalizations are not a result of the frequency of person/number splits in different linguistic areas.

Finally, the language sample contains a number of languages which have number but no person markers. Here, from 6 languages, the number marker is in 5 languages (83%) a suffix.

6.2.3 Analysis

The core of the explanation for the PER-NUM asymmetry are two simple alignment constraints:

(12) a. L $\Leftarrow$ [+Per] (Person-Agreement is at the left edge.)
b. [+Num] $\Rightarrow$ R (Number-Agreement is at the right edge.)

Considering the possible orders of simple number and person affixes w.r.t. a verbal stem, we get the possibilities in (13). Note that P and N are interpreted here in the strict sense, i.e. excluding the fused type [+PER +NUM]. The best candidate under each ranking is P > V > N, which corresponds closely to the empirical results where this is the overall favored ordering of person and number. The orders P > N > V and V > P > N each induce one constraint violation:

(13) Syntagmatic patterns of P and N

	L ⇦ PER	NUM ⇨ R	bounded by	Data
a. ✌ P > V > N			-	24
b. ☞ V > P > N	*		a.	17
c. ☞ P > N > V		*	a.	8
d. ☚ V > N > P	*	**	a.,b.,c.	5
e. ☚ N > P > V	**	*	a.,b.,c.	1
f. ✝ N > V > P	**	**	a.,b.,c.d.,e.	0

The 4th column in the table states for each candidate by which candidates it is harmonically bounded (Prince and Smolensky, 1993:129).

A candidate C harmonically bounds another candidate C' iff C does not induce more constraint violations than C' on any constraint, and C' induces at least one more constraint violation than C for at least one constraint. Thus, as far as the alignment constraints are concerned, (13c) can never be more harmonic than (13a) This imposes a natural fitness metric on the candidates which is indicated here by the symbols ✌ ☞ ☚ ✝. Interestingly, the order we get by this metric corresponds closely to the empirical data from the language sample. The number of corresponding languages can be found in the fifth column. By the more other candidates a candidate is bounded, by the less language patterns it is represented in the sample. The most important result is that the pattern P > V > N is the overall favored one, both in the sample and in the order imposed by the constraints.

Taking a different perspective, we can look for the best order of PER/NUM affixes if this order is already partially determined by other constraints. Assume that P and N are necessarily prefixes because otherwise some high-ranked third constraint would be violated. This means that we only have the options (13c) and (13e), in which case c. always will be preferred:

(14) Syntagmatic patterns of P and N (prefixes)

	L ⇦ PER	NUM ⇨ R	bounded by	Data
c. ☞ P > N > V		*	a.	8
e. ☚ N > P > V	**	*	a.,b.	1

In a mirror fashion, if some high-ranked constraint forces both P and N to be suffixal, we get (13b,d,) as candidates, where the first always out-ranks the latter:

(15) Syntagmatic patterns of P and N (suffixes)

	L ⇦ PER	NUM ⇨ R	bounded by	Data
b. ☞ V > P > N	*		a.	17
d. ☚ V > N > P	*	**	a.,c.	5

If no such restrictions are imposed on P and N, P V N is the optimal candidate. To make the picture complete, we have to look at the orders where P and N are partially fused and for the case where orders are determined paradigmatically, i.e., where the affixes do not cooccur in a single form, but relative order is determined by their order w.r.t. a third morpheme. Let us turn to the second case first. Data here are relatively spare because I used the paradigmatic data only if no identical syntagmatic data were available. Since always two orders have to be compared, these are separated by "/" in the tableaus:

(16) Paradigmatic Patterns of P and N

	L ⇦ PER	NUM ⇨ R	bounded by	Data
a. ✌ P > V/V > N	-/-	-/-	-	1
b. ☚ V > P/V > N	*/-	-/-	a.	0
c. ☚ P > V/N > V	-/-	-/*	a.	0
d. ✝ V > P/N > V	*/-	-/*	a.b.c.	0

(17) Paradigmatic Patterns of PN and N

		L ⇦ PER	NUM ⇨ R	bounded by	Data
a. ✌$_{PER}$	PN > V/V > N	-/-	*/-	-	1
b. ✌$_{NUM}$	V > PN/V > N	*/-	-/-	-	0
c. ☛	PN > V/N > V	-/-	*/*	a.	0
d. ☛	V > PN/N > V	*/-	-/*	a.b.	0

(18) Paradigmatic Patterns of PN and P

		L ⇦ PER	NUM ⇨ R	bounded by	Data
a. ✌$_{PER}$	P > V/V > PN	-/*	-/-	-	0
b. ✌$_{NUM}$	P > V/PN > V	-/-	*/-	-	0
c. ☛	V > P/V > PN	*/*	-/-	a.	0
d. ☛	V > P/PN > V	*/-	-/*	a.b.	0

Again, the data conform to the expectations. Note that V > PN/V > N in (17) and P > V/PN > V are not represented, even if optimal. This is because most paradigmatic order pairs were determined on the basis of the verbal stem as separator, which is impossible in these cases. Data are less clear if we turn to the syntagmatic aspects of PN and N, and PN and P. Such combinations are rather rare since they tend to be morphologically redundant.

(19) Syntagmatic patterns of PN and N

	L ⇦ PER	NUM ⇨ R	bounded by	Data
a. ✌$_{NUM}$ V > PN > N	*	*	-	2
b. ✌$_{PER}$ PN > V > N		**	-	1
c. ☞ PN > N > V		***	b.	1
d. ☞ V > N > PN	**	*	a.	1
e. ☛ N > PN > V	*	***	a.c.	0
f. ✝ N > V > PN	**	**	a.b.d.	0

(20) Syntagmatic patterns of PN and P

	L ⇦ PER	⇨ R NUM	bounded by	Data
a. ✌$_{NUM}$ P > V > PN	**		-	3
b. ✌$_{PER}$ P > PN > V	*	*	-	0
c. ☞ V > P > PN	***		a.	1
d. ☞ PN > P > V	*	**	b.	0
e. ☛ PN > V > P	**	**	a.b.	0
f. ✝ V > PN > P	***	*	a.b.c.	1

Interestingly, in (19), V > PN > N and PN > V > N are equally harmonic, depending on the fact whether L ⇦ PER or NUM ⇨ R are ranked higher. Correspondingly, in the data, this is the only case where the prefix/suffix combination is out-ranked by a pattern with homogeneous affixal status. (20) is more problematic. While one of the most harmonic candidates, P > V > PN, is also the most frequent language type in the sample, the worst candidate, V > PN > P, is represented more often than the other most harmonic candidate, P > PN > V. It is important to remember that the number of relevant examples here is only a handful, and we are talking about single exceptions of the basic claims which will find a principled explanation in section 6.2.6.

So far, the assumption of two alignment constraints makes two predictions, namely that PVN is the overall favored pattern and that the PER-NUM asymmetry should hold. The latter results from the fact that for all constellations considered so far (P/N,PN/N,PN/P, paradigmatic or syntagmatic) the candidates conforming to this generalization always harmonically bound the candidates violating it. The account makes two further predictions: Languages with number agreement should only have suffixal agreement markers since L $\Leftarrow$ PER is irrelevant here. This is illustrated in (21) where the candidate b. is harmonically bounded by a. Again, this conforms with the data presented in section 6.2.2.

(21) N only

	L ⇦ PER	NUM ⇨ R	bounded by	Data
a. ✌ V > N			-	5
b. ☚ N > V		*	a.	1

The second prediction is that in languages with fused agreement, i.e. agreement where NUM and PER agreement is always expressed by affixes marking both, the affixes should occur consistently prefixally or suffixally. This is true because the ranking in (22a) favors suffixes whereas the one in (22b) favors prefixes. No ranking is harmonically bounded by the other.

(22) P and N fused

	L ⇦ PER	NUM ⇨ R	bounded by
a. ✌$_{NUM}$ V > PN	*		-
b. ✌$_{PER}$ PN > V		*	-

Assuming that the ranking is essentially arbitrary for fused agreement marking, prefixes and suffixes should be distributed rather evenly in the languages of the world. This is confirmed empirically by Hawkins and Gilligans (1988:225) who find that certain order preferences for other categories (suffixing over prefixing in certain contexts) do not hold for subject-person marking. In other words, there is no preference for prefixing or suffixing. Since most instances of "person marking" in their corpus are obviously person-number marking, this is what we expect. The same result is obtained from data presented in Julien (2000:360): In 93 genera she finds that subject agreement is suffixal while it is prefixal in 85.[2] In my data, fused person/number is prefixal in 30 (42,3%) and suffixal in 41 (57,7%) of 71 patterns.

6.2.4 Two Case Studies

Muna

In Muna, the number affix *-amu* follows the stem while the pure person markers (*o-* [+2 -1], *do-* [+1 +2], *to-* [+2 +pol]) precede it (van den Berg, 1989:51):[3]

[2] I considered only the cases where SAgr is an affix bounded to the verb while Julien also considers other realizations of SAgr. Taking the full range of data into consideration does not change the result.

[3] +pol stands for a special 2nd person form used in polite speech.

(23) Muna agreement affixes

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

This follows from the assumed constraints under any ranking

(24) *o-kala-amu*, 'you (pl.) go'

	L ⇦ PER	NUM ⇨ R
☞ P > V > N		
P > N > V		*!
V > P > N	*!	
N > V > P	*!*	**

That the ranking is indeed L ⇦ PER ≫ NUM ⇨ R and not the other way around can be seen from the fact that fused person/number markers (*ta*-, [+1 -2 +pl], *do*-, [+3 +pl]), which are subject to both constraints, share the position of person, not the position of the number marker:

(25) *ta-kala*, 'we go'

	L ⇦ PER	NUM ➪ R
☞ PN > V		*
V > PN	*!	

Georgian

shows the opposite ranking of L ⇦ PER and NUM ➪ R as Muna. While pure person (*v*-, 1st person) and pure number agreement (-*t*) also occur at the left and right edge (26) under this ranking, the 3pl marker *-en* (27) is on the right of the stem:

(26) *v-xatav-t*, 'we see'

	NUM ➪ R	L ⇦ PER
☞ P > V > N		
P > N > V	*!	
V > P > N		*!
N > V > P	*!*	**

(27) *xatav-en*, ‘they see’

	NUM ➪ R	L ⇦ PER
PN > V	*!	
☞ V > PN		*

6.2.5 Extending the Account

Differentiation in Person and Number

The typology presented so far is oversimplified because number and person are not further differentiated. Thus, number has at least the possible values sg, pl, and dual (for discussion see Noyer (1992)), which might have different positional properties. Consider for example the cooccurring plural and dual markers in Gahuku (Foley, 1986:133).

(28) *ni-v-a-si-ve* ‘They two are going’
PROG-go-3pl-DU-PL:DECL

Clearly more should be said about this, but it is difficult to get a sufficient amount of data. Dual marking itself is relatively rare and where it occurs it is often in complementary distribution with plural marking. This makes it difficult to find any positional differences[4].

[4]Dual also might be a person instead of a number category. Thus a dual inclusive often patterns with singulars rather than with plural or duals. See Noyer (1992) for discussion.

There is a further asymmetry in that affixes marking agreement with singular might often be unmarked for number altogether. This can be seen most clearly in Georgian where the marker for 1st person singular, *v-*, also occurs in the plural *v-xedav-t*. Hence, it cannot have an explicit number marking. On the other hand, the 3sg affix *-s* never occurs for marking plural NPs. Hence, we have the option to specify it [+3 +sg] or simply [+3]. Indeed, in this case, we are led to the conclusion that it is marked [+sg] by its positional properties.

Different person features can induce differing positional properties, too. Thus, in Wardaman, 1st person markers generally precede 2nd and 3rd person markers:

(29) a.

nga-	*n-*	*nu-*	/	*nga-*	*nu-*	*n-*
[+1]-	ACC-	[+2]-		[+1]-	[+2]-	

‘you (nsg.) → me’/‘I → you (nsg.)’

b.

nga-	*wu-*	*n-*	/	*nga-*	*n-*	*wu-*	*rr-*
[+1]-	[+3]-	ACC-		[+1]-	ACC-	[+3]-	[+Nom+pl]-

‘I → them’/‘they → me (sg.)’

c.

yi-	*wu-*	*n-*	/	*yi-*	*n-*	*wu-*	*rr-*
[+2]-	[+3]-	ACC-		[+2]-	ACC-	[+3]-	[+Nom+pl]-

‘you (sg.) → them ’/‘they → you (sg.)’ (Merlan, 1994:127)

In Menominee, the marker for 3rd person plural follows those for first and second person plural:[5]

(30) a. *ke-na·n-ek-w-owaw-ak* *(kena·nekowawak)*
2-Stem-D-[+3]-[-1+pl]-3pl
'they fetch you (pl.)'

b. *ne-na·n-ek-w-enaw-ak* *(nena·nekwenawak)*
1-Stem-D-[+3]-[+1+pl]-3pl
'they fetch us (exc.)' (p. 154)

Both of these cases are consistent with the assumption of a hierarchy:

(31) L ⇦ [+1] ≫ L ⇦ [+2] ≫ L ⇦ [+3]

However, there are also cases where L ⇦ [3] seems to be ranked higher than the other alignment constraints. This is the case in Kanuri (see (54)) and Dakota (44).

I hypothesize that constraints on specific person/number values arguably exist but are more restricted in application than the general constraints on person and number. Furthermore, they generally tend in the same direction as their "hyper-constraints". A constraint that aligns dual aligns it to the right just as NUM ⇨ R, while ALIGN +1

[5]If the verb agrees with a first and a second person plural argument, plurality of 2nd person is not marked at all, thus no order can be determined. See 7.2.4 for an account.

refers to the left edge as does L ⇦ PER. Sub-constraints of this type might be responsible for certain violations of the PER-NUM asymmetry. E.g. in Nyangumarda (Hoard and O'Grady, 1976:55,58) there is an affix which marks plural (*-yi*) and one (*-rni*) for [+1 -2 -du], i.e. for exclusive singular or (non-dual) plural forms. Making just the rough differentiation between P and PN we expect that *-rni* should precede *-yi*, but in fact it is the other way around:

(32) *wirri-rni-yi-rni* 'we put (exc. pl.)'
put-IND-[+pl]-[+1-2-du]

However, splitting NUM ⇨ R into PL ⇨ R and DU ⇨ R and ranking the latter higher results in the desired order, which is illustrated schematically in (33):

(33) Ranking accounting for (33)

	DU ⇨ R	PL ⇨ R	L ⇦ PER
☞ V > [PL] > [PER DU]		*	**
V > [PER DU] > [PL]	*!		*
[PL] > [PER DU] > V	*!	**	*
[PER DU] > [PL] > V	*!*	*	

Gender

Besides person and number, subject agreement often reflects gender features. Under the account developed here, we would expect that these features are also subject to some specific alignment constraints. I do not have the space to treat this in detail here, and the matter is complicated by the fact that gender seems to be fused even more often with person than number, which makes any investigation difficult. Nonetheless, I will make here some tentative assumptions that shed a light on data that seem problematic w.r.t. the PER-NUM-asymmetry.

The only case I am aware of where gender agreement is split off from person agreement in a relative clearcut way[6] is Afro-Asiatic, especially Semitic. For example, in the Amharic prefix conjugation, gender and number affixes follow the verb while person and PN affixes precede it (34).

This suggests that analogously to NUM ➪ R there is a constraint GEND ➪ R which aligns gender to the right edge of the morphological domain.

[6]Another interesting language family are Caucasian languages such as Lak. But here gender often seems to interact with number marking in a complex and poorly understood way. See e.g. Ortmann (1998).

(34) Amharic Prefix Conjugation

Prefixes		Suffixes	
yə-	[+per +3]		
tə-	[+per]	*-u*	[+pl]
ə-	[+per +1]	*-i*	[+fem]
ənnə-	[+per +1 +pl]		

If this is on the right track, it is plausible that GEND ➪ R also can induce violations of the PER-NUM asymmetry, as is shown in the following case from Isthmus Zapotec (Pickett, 1955:221), where person follows number marking:

(35) *ru-ʔunda-ka-beé* 'they (an.) sing'
HABIT-sing-PL-[+3+an]

Assuming that GEND ➪ R is ranked over NUM ➪ R , and that the prefix option for subject agreement is not available, we now get the observed order:

(36) Ranking of Isthmus Zapotec

	GEND ➪ R	NUM ➪ R	L ⇦ PER
☞ V [NUM] [PER GEND]		*	**
V [PER GEND] [NUM]	*!		*

A possible problem with this is that the offending order is also observed with 1st person affixes which show no overt differentiation for gender:

(37) *ru-ʔnda-ka-nuú* ‘we (inc.) sing’
HABIT-sing-PL-[+1+2]

But while *-nuú* could be possibly underspecified for gender, it is equally plausible that [-3] arguments in Zapotec are assigned the value +animate, and that this feature is also present in *-nuú* which would then be [+1 +2 +an].

Constraints on Object agreement

It is a natural question if the constraints for subject agreement assumed here also carry over to object agreement. Indeed, in many polysynthetic languages, especially of the type to be discussed in chapter 7, subject and object agreement is largely marked by the same person and number markers in the same position, i.e. with the same basic order generalizations, as in Menominee:

(38) a. *ke-na·n-ek-w-owaw-ak* *(kena·nek-owawak)*
2-Stem-D-[+3]-[-1+pl]-3pl
'they fetch you (pl.)' (p. 154)

b. *ke-na·n-a·-w-a·w-ak* *(kena·na·wa·wak)*
2-Stem-D-[+3]-[-1+pl]-3pl
'you (pl.) fetch them' (p. 152)

But while there is a considerable number of languages where positional contrasts between person and number marking is restricted to subjects, there are few where this is true for object agreement. Two cases where this happens are object agreement in Yurok (39) and Spanish clitic clusters (40)

(39) *ˀne-koˀmoyo-s*-**ˀ**-*oˀ*
1-hear-O3-Opl-S1pl
'we hear them' (p. 75)

(40) *El libro, a ellos quién* ***se lo-s*** *prestó?*
the book to them who se 3:ACC-PL lent(3sg)
'Who lent the book to them?' (Grimshaw, 1997:20)

In (40), according to the analysis proposed in 4.1.2, the number marker *-s* (in *los*) is separated from its corresponding clitic stem *s-* (in *se*). Thus, we have a case of discontinuous spell-out analogously to the data that were discussed in 5.2.2.

The typological literature finds that object agreement is similar to subject agreement in being somewhat resistant to the general suffix preference which also favors the view that both types basically obey the same partly rightwards, partly leftwards oriented constraints. Thus, Hawkins and Gilligan (1988, fn. 4) find that object agreement has a preference for prefixing while they cite (p.c.) results by Dryer where there is almost parity for suffixing and prefixing. Constraints on subject and object agreement must differ to some degree since there are languages such as Swahili where the ordering of subject and object agreement differs even though the actual markers can mark both categories (see 2.1). Thus a possibility would be that there are constraints on PER/NUM applying to any kind of (subject and object) agreement and corresponding constraints applying only to subject agreement. This would predict the fact that subject agreement tends to precede object agreement, as shown by the data from Siewierska and Bakker (1996) in (41).

This tendency might be obscured by the fact that object agreement is not necessarily attached to Tense. In many Indo-European languages, it is instead realized on a specific clitic head, which exhibits movement.

(41) The order of SAgr and OAgr (Siewierska and Bakker, 1996:150)

		SAgr > OAgr	OAgr > SAgr	both
prefixes	N = 30	17 57%	8 27%	5 16.6 %
suffixes	N = 24	11 46%	10 42%	3 12.5 %
mixed	N = 38	24 63%	13 34%	1 3 %
Total	N = 92	52 56.5%	31 33.6%	9 9.8 %

A point where the differentiation of subject and object constraints can shed light on intricate ordering patterns is the order of agreement affixes in Dakota. The relevant data from 5.2.3 are repeated in (44) and (43). The pattern in (44) can now be simply accounted for by the constraints in (42):

(42) $\mathrm{L} \Leftarrow [+3] \gg \mathrm{L} \Leftarrow [+1] \gg \mathrm{L} \Leftarrow [+2]$

This is a natural account given the differentiation in person alignment proposed in 6.2.5.

(43) *iye-ni-ma-čheča* 'I resemble you'
V-2sg-1sg-V

(44) Dakota agreement Prefixes

	3rd person >	1st person >	2nd person	
a.	*wić^{h}a*	*wa*		1:3pl
b.	*wić^{h}a*	*ũk*		1pl:3pl
c.	*wić^{h}a*		*ya*	2:3pl
d.		*ma*	*ya*	2:1
e.		*ũk*	*ya*	2:1pl
f.		*ũk*	*ni*	1pl:2

However, like other proposed accounts (see 5.2.3), this leads to the wrong order with deponent verbs as in (43), where both arguments of a transitive verb are realized by patient markers. To understand this order, it is necessary to take a closer look at the distribution of number and person marking in Dakota

(45) Number and Person in Dakota Prefixes

wa	1sg	***ũk*** 1 dual inc.	***ũk-*** ... *pi*	1.pl
ya	2.sg	*ni-*	***ya-*** ... *pi*	2.pl

While in all other persons plural is formed with the prefix used in the singular, in the 1st person, it is the dual inclusive marker *ũk*. This suggests that *ũk-* is a default 1st person affix ([+1]) while *wa-* and *ma-*

are [+1 +pat +sg] and [+1 +ag +sg] respectively. On the other hand, *ni-* is specified [+2]. If SG ➪ R is ranked higher than L ⇦ 2 the order in (43) follows:

(46) The Order of *ni-* and *ma-* ('I resemble you')

	SG ➪ R	L ⇦ 1	L ⇦ 2
☞ ni [2] ma [1sg]		*	
ma [1sg] ni[2]	*!		*

The problem is now that we would also expect **ya* [+2 +ag] *ma* [+1 +sg +pat] instead of *ma-* [+1 +sg +pat] *ya-* [+2 +ag]. This can be resolved by splitting L ⇦ 2 in two corresponding constraints relativized to grammatical function, where L ⇦ [+2 +pat] is ranked lower and L ⇦ [+2 +ag] higher than SG ➪ R :

(47) The Order of *ni-* and *ma-* (revised)

	L ⇦ [2ag]	SG ➪ R	L ⇦ 1	L ⇦ [2pat]
☞ ni [2pat] ma [1sg]			*	
ma [1sg] ni[2pat]		*!		*

(48) The Order of *ya*- and *ma*- (2 → 1sg)

	L ⇦ [2ag]	SG ⇨ R	L ⇦ 1	L ⇦ [2 pat]
ya [2ag] ma [1sg]	*!		*	
☞ ma [1sg] ya[2ag]		*		*

Coherence

The positioning of the accusative marker in Wardaman agreement provides evidence that there is a further type of constraints on affix order:

(49) a. *nga- n- nu-* / *nga- nu- n-*
[+1]- ACC- [+2]- [+1]- [+2]- ACC-
'you (nsg.) → me'/'I → you (nsg.)'

b. *nga- wu- n-* / *nga- n- wu- rr-*
[+1]- [+3]- ACC [+1]- ACC- [+3]- [+Nom+pl]
'I → them'/'they → me (sg.)'

c. *yi- wu- n-* / *yi- n- wu- rr-*
[+2]- [+3]- ACC- [+2]- ACC- [+3]- [+Nom+pl]-
'you (sg.) → them'/'they → you (sg.)' (Merlan, 1994:127)

As already discussed in 6.2.5, the most simple account for this pattern is to assume a constraint that requires the adjacency of affixes spelling out the same head (COHERENCE).

Coherence is also a candidate to account for the fact that number agreement can appear prefixally (50a) and person agreement suffixally (50b) even though both are split:

(50) a. *t-i-s-hal-vən-aan-ru*
FUT-S1-NEG-TRI-go-NEG-attempt
'We three (exc.) will not try to go' (Lenakel, Tryon, 1973:41)

b. *keen-t-aa-n*
bring-2-PRS-PL
'you (pl.) bring' (Somali, El-Solami-Mewis, 1987:75)

Assume that there is a constraint COHERENCE {[+V] [+Nom +Agr]}. According to the definition of COHERENCE in 3.3, this will always disfavor candidates where subject agreement affixes are on different sides of the verb (51).

If this is ranked higher than NUM ➪ R and L ⇦ PER, it blocks the order PVN which would otherwise be optimal. Depending on the ranking of the alignment constraints, we get P N V (50a) or V P N (50b), as shown in (52) and (53):

(51) Overall effect of COHERENCE(V,A)

	COHERENCE(V,A)	bounded by
a. ✌ P > N > V		
b. ✌ V > P > N		
c. ✌ N > P > V		
d. ✌ V > N > P		
e. ✝ P > V > N	*	a.b.c.d.
f. ✝ N > V > P	*	a.b.c.d.

(52) Number-Driven COHERENCE

	COHERENCE(V,A)	NUM ➪ R	L ⇦ PER
☞ V > P > N			*
P > N > V		*!	
P > V > N	*!		
V > N > P		*!	**
N > P > V		*!*	*
N > V > P	*!	**	**

(53) Person-Driven COHERENCE

	COHERENCE(V,A)	L ⇦ PER	NUM ⇨ R
V > P > N		*!	
☞ P > N > V			*
P > V > N	*!		
V > N > P		*!*	*
N > P > V		*!	**
N > V > P	*!	**	**

Taken together with the differentiation in person alignment (6.2.5), COHERENCE also can induce violations of the PER-NUM asymmetry as in Kanuri (Cyffer, 1992):

(54) Kanuri

1sg	*lad-é-**k**-in*	**1pl**	*lad-í-**ye**-n*
2sg	*lad-é-**m**-in*	**2pl**	*lad-ú-**w**-in*
3sg	***se**-lad-în*	**3pl**	***s-a**-lad-în*

Under the assumption that the 1st and 2nd person affixes mark person and number [+PER +NUM], it is unexpected to find the pure plural marker -*a* leftwards from them. However, the ranking in (55) has the effect that the 3rd person marker will be on the left while 1st/2nd person affixes are dragged to the right by NUM ➪ R . To satisfy COHERENCE, *a*- also appears on the left even though this violates NUM ➪ R

(55) COHERENCE $\gg$
L ⇦ [+3] $\gg$ [NUM] ➪ R $\gg$
L ⇦ [+2] $\gg$ L ⇦ [+1]

6.2.6 Apparent Counterexamples

Although the PER-NUM asymmetry seems to hold for a wide range of languages, there are counterexamples. I will show that these can be addicted to three factors: 1) Verbal plural markers that do not realize subject agreement but are incorporated quantifiers. 2) Affixes that encode other features than person and number, and 3) Quasi-fused affixes which are bounded by their context-restrictions to morphemes in positions not expected by the proposed constraints.

Quantifiers as Plural Markers

In **Jaqaru** (Hardman, 1966:53), plural agreement marking seems to precede person marking:

(56) *saynqu-rqay-k-i-wa* 'they all stand up'
V-PL-TNS-3-TAM

However, Hardman notes that in Jaqaru "plurality is not an inflectional category" (p. 46). The plural marking both on nouns and verbs is "emphatic" (ibd.) and "the absence of the plural suffix does not imply singular." (p. 53) Since "the usual translation is 'all' or 'everyone' " (ibd.), it is plausible that it is an incorporated quantifier.

Navajo has a plural prefix also preceding person (+number) marking:

(57) *de- ín- íi- kááh*
PL ... 1pl ... *V*
'we (each) are walking alone' (Young and Morgan, 1998:62)

Young and Morgan (1998) describe its meaning as distributive. Thus, (57) is opposed to (58): [7]

(58) *y- íi- kah*
... 1pl ... *V*
'we (together) are walking alone' (Young and Morgan, 1998:62)

[7] Mark Aronoff (p.c.) notes that Rice (2000) locates a second number slot in Athabaskan which also precedes other subject agreement. Rice's arguments that the relevant affixes – descriptively marking plural and unspecified 3rd person subjects – express the category number, seem not really conclusive to me. More crucially, she shows convincingly that the relevant "number" affixes are not agreement markers.

Thus, as in Jaqaru, this marker is not agreement but has lexical meaning, which is also confirmed by the fact that it "occurs with all word classes (nouns, postpositions and some types of particles as well as verbs)" (ibd.). Again it seems to be a kind of incorporated quantifier roughly speaking having the meaning "each".

In **Walapai** (Redden, 1966), the plural markers *-č* (paucal) and *-v* ("multiple plural") always precede the person suffixes:

(59) *yam-či-k-yu* 'they left' (p. 158)
leave-PL-[-2]-ASP

Again, this is a marker which does not obey agreement in the strict sense: If "the verb is marked for plural ..., the subject may or may not be marked for plural ... if the independent subject is marked for multiple plural, the verb is not marked only for plural [paucal,JT] " (ibd:150). Both affixes also occur on nouns (ibd:143) and in a different positional slot as markers of repeated intensified verbal action. Thus, while the exact analysis of these items is far from clear, they might represent quantifiers meaning "in few" and "in many" which are interpreted somewhat differently according to different positions and scope.

Involvement of a Third Feature

I have already discussed some counter-evidence to the PER-NUM asymmetry which can be adduced to the interaction with other alignment constraints. This is clear in Nyangumarda where different sub-constraints of NUM ➪ R are involved and Zapotec where a high-ranked GEND ➪ R discards the expected effects of the other alignment constraints. Both factors conspire in the Papuan language Nimboran to create a seemingly systematic contradiction to the expected order. The plural marker <*i*> as well as the dual marker -*k* precede the person markers (60a,b).

(60) a. *ŋguá-k-bá-k-u* 'We two bit above.'
bite-SDu-2Loc-PAST-1

b. *ŋgedói-<i>-d-u* 'We will draw' (p. 568)
draw-PL-OPl-FUT-1

In the same vein, the 1st person singular inclusive marker -*maN* precedes the general inclusive marker -*ám*, which is not specified for number:

(61) *ŋgedúo-maN-d-ám*
draw-[+1+2+sg]-FUT-[+1+2]
'you (sg.) and I(sg.) will draw' (p. 567)

In total, we have N > P where we expect P > N, and PN > P instead of P > PN. Since -*maN* always occurs after certain items preceding otherwise dual -*k*, we even have N > PN.

Note first that any discussion of the plural marker -<*i*> is problematic since it seems non-segmental in nature: It occurs at different positions in the suffix string according to phonological factors or is even completely suppressed. Inkelas (1993:570) suggests that it “consists in underlying representation of some phonological feature, e.g. [+high]”, and concludes: “As a feature, the PlSubj marker could be introduced anywhere - and still link at the edge by phonological rule.”(ibd.)

The order of -*maN* [+1 n+2 +sg] and -*k* [+du], as in Nyangumarda, involves two different number features. Thus, ranking SG ⇨ R over DU ⇨ R and L ⇦ PER accounts for this pattern. The word-final position of Nimboran as in Zapotec is also the location of gender marking, where masc 3rd person is marked by -*am* and fem/neut by -*um*. Again, we can assume that the 1st/2nd person markers have a minimal gender specification for +animate. Then, a high-ranked GEN ⇨ R will ensure that person is dragged to the right of all number marking.

The cases discussed up to this point all had to do with alignment constraints on subject agreement. A further class of problematic patterns results from the fact that subject agreement is often fused with contentful categories like tense and aspect.

For example, **Amharic** (Leslau, 1995:287,301) patterns in affix order with Muna: In split person number marking *(yə-säbr-u)*, person marking (*yə*-) is left-peripheral and number marking rightwards (-*u*). Combined person/number agreement is again leftwards (*ənnə-säbər*):[8]

(62) Amharic

	Imperfect	Perfect
3. sg. masc	*yə-säbər*	*säbbär-ä*
3. sg. fem	*tə-säbər*	*säbbär-äcc*
2. sg. masc	*tə-säbər*	*säbbär-h*
2. sg. fem	*tə-säbr-i*	*säbbär-sh*
1. sg.	*ə-säbər*	*säbbär-hu*
3. pl.	*yə-säbr-u*	*säbbär-u*
2. pl.	*tə-säbr-u*	*säbbär-accuh*
1. pl.	*ənnə-säbər*	*säbbär-n*

However, this observation only holds for the unmarked imperfective aspect. In the perfective, all agreement morphology is suffixal. Since in the perfective paradigm there is a full differentiation in 3 persons, at least some of these markers have to be specified for person and should therefore be leftwards. While this is not strictly a counterexample

[8]See (7) in 5.2.1 for the feature values of single affixes.

to the PER-NUM-Asymmetry, it is at first glance counter-evidence to its explanation using alignment constraints. The solution to this puzzle lies in the difference between perfective and imperfective. Since there is no other affixal marking for the perfective, we can assume that the perfective markers are actually portmanteaus, marking aspect *and* agreement. If the aspect head follows the verb in Amharic, and the order of contentful categories is fixed by syntactic hierarchy, the suffixal status of these items follows.

Semi-Fused Affixes

Arregi (1999) shows convincingly that person and number marking in Basque absolutive agreement is for the most part realized by the same affixes as the corresponding features in DPs (e.g. pronouns):

(63) Basque Agreement Affixes

Prefix(Person/Number)	Stem	Suffix(Person/Number)
g- (1stPl)		-*a* (3rd)
n- (1stSg)		-*e* (Pl)
s- (2nd)		

Taking this set of affixes, he notes that " there seems to be no correlation between the position of each affix and the type of feature it is realizing. Thus, some prefixes such as first plural *g*- encode both person and number, while others such as second person *s*- only encode person. On the other hand the plural suffix -*e* encodes only number, while -*a* encodes only person. This suggests that the position of the affix with respect to the stem is not determined by the features it realizes; rather it seems to be an idiosyncratic property of the specific affix that is inserted." (ibid:241) This statement seems to be corrobated by the fact that absolutive agreement with 3rd person arguments in verbs is consistently expressed by the way of prefixes. (ibid:255). Thus, we cannot say that the asymmetry in (63), say between -*a* and *n*-, is due to different constraints on first and 3rd person.[9]

However, the order of *g*- (1stPl), *n*- (1stSg) and -*e* (Pl) is completely derivable from the constraint ranking L ⇦ PER $\gg$ NUM ⇨ R . If we regard only the position of -*a* (3rd) as idiosyncratic, Basque behaves just like Amharic: Pure number affixes are suffixes while person and Person/number markers are prefixal. Interestingly, the unexpected position of -*a* (3rd) corresponds with another idiosyncratic fact in its behavior. In contrast to the other PER/NUM affixes it is restricted to a specific context, which Arregi calls "nominal environment". I will

[9]An account of this type might be the right one for another suffixal person affix -*t*, which marks 1sg ergative and dative agreement. Assuming that -*t* is marked for number, it can be dragged to the right by a high-ranked SG ⇨ R.

interpret this as the requirement that -*a* be right-adjacent to a [+N] X^0: This context can be instantiated by a pronoun[10] (64a), the relative particle surfacing in headless relatives (64b), or an adjective (64c):

(64) a. *ber-**a***
he-3
'he (abs.)' (p. 246)

b. *Jon ikusi dab-en-**a***
John(abs.) see AUX-REL-3
'the one that saw John' (p. 234)

c. *Nire txatur-**a**-k sarr-**a**-k dis*
my dog-3-PL old-3-PL are
'my dogs are old' (p. 235)

Since the alignment constraints proposed in this thesis are especially designed for agreement categories, one could argue that the offending position of -*a* is due to the fact that it is not an agreement marker. This is true in (64a), but it seems to act as an agreement affix in (64b), where it marks concord of the predicate with the subject and still is suffixal.

[10] Arregi argues that pronominal stems in Basque do not bear any features but are inserted to fulfill affixal requirements. However, his arguments for this only regard the stems that surface in non-third persons.

Thus, we have to relate the deviant position of -*a* to its context restriction, which indeed is very natural in DO. Recall that surface context restrictions were argued in 3.2.3 to specify the position of the required context. Hence, if -*a* requires a nominal element to its left, it will surface as a suffix to the relevant item. Since context restrictions are inviolable, this will lead to a violation of the relevant alignment constraints.

This might look like the reintroduction of affixal status through the back-door. But this can only be stipulated for a VI by a context restriction if it acts as a semi-fused affix, i.e., an item which always occurs adjacent to and in a fixed order w.r.t. a specific type of X^0.

A further example of this type are the plural allomorphs in Teda (Bryan and Tucker, 1966:184,185):

(65) a. *kɔs-**ed**-ər* 'we do'
do-PL-S1

b. *ye-gɔs-**o*** 'they do'
S3-do-PL

c. *ti-r-**o*** 'we come'
S1-come-PL

Note that *kɔs (kɔs)* (65a,b) and *r-* (65c) belong to different verb classes, which explains the 1st person prefix in (65c) in contrast to the suffix in (65a). Crucially, the allomorphy of the plural affix can neither be triggered by a verb class nor by person features since *-o* cooccurs in principle with all classes and all person features. What triggers *-ed* seems to be that it is left-adjacent to a person marker, i.e. it should have the context specification / __ [+Per]. Again, this is already sufficient to account for its unexpected position. In Northwestern Mekeo, the plural marker is always left-adjacent to person markers:

(66) Northwestern Mekeo (Jones, 1998:229)

	sg	**pl**
1	*a-*	*g-a-*
2	*o-*	*g-o*
3	*e-*	*g-e-*

Interestingly, there is another variety of Mekeo where an additional sg marker appears, but where no number marking occurs in the 3sg and 1/2pl (67). To account for the restriction that sg *l-* occurs only in 1st/2nd person and pl *k-* only in 3rd person contexts, again context restrictions are necessary. These are shown in (68):

(67) Eastern Mekeo (Jones, 1998:229)

	sg	**pl**
1	***l-****a-*	*a-*
2	***l-****o-*	*o*
3	*e-*	***k-****e-*

(68) /l/ $\leftrightarrow$ [+sg] /__ [-3]
/k/ $\leftrightarrow$ [+pl] /__ [+3]

Since these restrictions are independently motivated, no additional stipulation is needed to derive the unusual ordering of person and number.

While context specifications can impose constraint violations, it is expected by lexicon optimization (Prince and Smolensky, 1993:192f.) that languages should tend to get rid of such specifications. In Elamite (Reiner, 1969), where it can be assumed that the plural marker -*h* has the restriction / __ [+per], exactly this happened. In the transition from Middle Elamite to Royal Achaemenid Elamite, the offending plural marker disappeared.

(69) Elamite (Reiner, 1969:76)

	Middle Elamite	
	sg	**pl**
1	*-h*	*-h-h*
2	*-t*	*-h-t*
3	*-š*	*-h-š*

	R.A. Elamite	
	sg	**pl**
1	*-h*	
2	*-t*	
3	*-š*	

Another revealing case of a semi-fused affix is the **Quechua** plural suffix *-ya* (Lakämper and Wunderlich, 1998), where additional evidence again can be found that the offending order N > P, induced by an idiosyncratic context-specification of the number affix, is not representative for the general tendency of number agreement.

Note first that N > P only occurs in Ancash Quechua (70a) while the unmarked (opposite) order holds in Ayacucho Quechua (70b):

(70) a. *V-**ya**-n* (Ancash Quechua)
V-PL-3

b. *V-n-ku* (Ayacucho Quechua)
V-3-PL

In Ancash possessor agreement, which is otherwise almost completely parallel to intransitive subject agreement, number marking is taken over by another suffix (-*kuna*) which uniformly follows person markers and thus restates the expected order:

(71) Quechua Nominal and Verbal Agreement

	Verbs		**Nouns**	
	sg	**pl**	**sg**	**pl**
1	-*V*	***-ya***-*V*	-*V*	-*V*-***kuna***
2	-*nki*	***-ya-***-*nki*	-*yki*	-*yki*-***kuna***
3	-*n*	***-ya-***-*n*	-*n*	-*n*-***kuna***
1+2		-*ntsik*		-*ntsik*

Finally, the 1st plural inclusive marker -*ntsik* [+PER +NUM], always occurs in final position if it marks object agreement and vacuously if it marks subject agreement. Thus we find again evidence a preference for the rightwards tendency of plural marking.

Technically, the position of -*ya* can be accounted for by a context restriction such as V__. Indeed, -*ya* seems always to occur right-adjacent to the stem or derivational markers[11] which can be analyzed as light verbs (cf. Parker, 1976). Lakämper and Wunderlich (1998) independently propose such a context restriction[12] to account for the fact that

[11]E.g. causative affixes.

[12]With the difference that a context restriction under their premises does not imply adjacency.

-*ya* cannot appear in nominal inflection (cf. (71)). This shows that also in this case there are independent reasons for a context restriction. The account with a context specification also explains the fact that other plural affixes in Ancash such as the nominal plural marker -*kuna* obey the alignment constraint on plural affixes.

Again, under lexicon optimization, such a context specification will lead to reanalysis whenever it is possible. This is confirmed by the fact that in three of four Quechua dialects discussed by Lakämper and Wunderlich (1998) -*ya* is abandoned in favor of a plural marker in the canonical order.

The Distribution of N > P

(72) gives an overview of the factors that cause violation of the Person-Number Asymmetry (PNA) in the discussed languages.

A striking empirical result from 6.2.2 is that the Person-Number-Asymmetry is stronger for cases where person and number affixes are on different sides of the stem. This follows from the mechanisms which allow for violations of the PNA.

(72)

Language	**Offending Pattern**	**Explanation**
Navaho		Plural Quantifier
Jaqaru		Plural Quantifier
Walapai		Plural Quantifier
Kanuri		Third Alignment-Constraint
Nimboran		Third Alignment-Constraint
Nyangumarda		Third Alignment-Constraint
Zapotec		Third Alignment-Constraint
QuechuaI		Semi-Fused Affix
Elamite		Semi-Fused Affix
Mekeo		Semi-Fused Affix
Teda		Semi-Fused Affix

In order to see this, imagine an order N > V > P which is triggered by the context restrictions of the involved affixes. To achieve this, we would need two relevant context restrictions such as:

(73) a. PER / V__
b. NUM / __ V

To achieve N > P > V or V > N > P, only one such specification is necessary, e.g. NUM / ___ V. If L ⇦ PER is ranked higher, this will lead to N > P > V. If NUM ⇨ R is ranked higher, we get V > N > P. Moreover, adjacency of agreement affixes is independently enhanced by other constraints such as COHERENCE. N > V > P is additionally marked, e.g. by REFLECT (see 6.4.1).

Further, violations of the PNA are most frequent in suffixal positions. This is due to the fact that most cases of "third constraint" influence are due to constraints tending to the right. For illustration, just take two hypothetical examples:

(74) a. [+1 +sg] > [+2] V

b. V [+pl] > [+1 +du]

(74b) is a typical example of what we have observed in the last sections while we did not encounter anything like (74a). The reason is, I think, that it is much less likely to detect a positional difference in number features than in person features since the first group more often cooccurs, i.e. patterns like (74b) are relatively more frequent than those like (74a) even though we abstract away from order.

6.3 The Relative Order of Direction Markers vs. Subject Agreement

A second case of the alignment pattern are the precedence relations between subject agreement and single affixes marking subject *and* object agreement. In many cases, we expect that such portmanteaus block subject agreement. Hence, in most cases, no positional differences to simple subject agreement markers can be detected. An example is the Ancash Quechua affix -*q* marking 1st person subject/2nd person object:[13]

(75) *rika-q*
see-1:2
'I see you' (Lakämper and Wunderlich, 1998:121)

However, there is at least one class of portmanteaus that typically cooccur with simple subject agreement, namely so-called direction markers (glossed as D), which will be discussed in detail in chapter 7. Consider e.g. the Chukchi direction marker *ine-* which in contrast to the Quechua case appears in addition to a subject marker:

[13]Other apparent instances of portmanteaus should be analyzed as subject markers. For example, in Hungarian, almost all agreement affixes used in transitive agreement are also involved in agreement with specifiers of intransitive predicates.

(76) *ine-l^{ʔ}u-tək*
D-see-2pl
'you (pl.) saw me' (Chukchi, Krause, 1976:183)

6.3.1 Data and Account

The occurrence of ordering patterns involving direction markers is restricted to polysynthetic languages. Hence, I have only 9 relevant languages in my sample with 11 ordering patterns.

The results are very clear: Direction markers almost always precede other agreement markers, regardless whether both are suffixes (77), both are prefixes (78) or affixal status is mixed (76):

(77) *pe-fi-i-m-i*
see-D-IND-[+3]-[+sg]
'you (sg.) saw him' (Mapudungun, Grimes, 1985:152)

(78) *k-ì-ràm-ì*
D-2-beat-ASP
'you (sg.) beat me' (Turkana, Dimmendaal, 1983:123)

(79) lists the patterns I found in my survey. "D" stands for direction marker, and "S" for a simple subject agreement marker:

(79)

	both prefix	both suffix	mixed
D > S	Turkana Nunggubuyu	Menominee Chukchi Dumi Mapudungun Yurok Nocte	Chukchi Dumi Jyarong
S > D			Menominee

We could account for this in a parallel fashion as for the PER/NUM asymmetry by stating that direction marking tends to the left while simple subject marking tends to the right. But this would interfere in an undesirable way with the account for the PER/NUM data which implies that there is no simple tendency for agreement to the right edge.

Therefore, I propose to assume a single additional constraint which requires direction markers to align to the left edge. If direction markers are not marked for number[14], but for person, and L ⇦ PER applies to them, direction markers will always be more optimal if they appear leftwards to person/number (80), pure person (81), or pure number

[14]Cases where direction markers are marked for number will be discussed below.

(82) subject agreement.

(80) D + PN

	L ⇦ DIR	L ⇦ PER	NUM ⇨ R
☞ D > PN		*	
PN > D	*!	*	*

(81) D + P

	L ⇦ DIR	L ⇦ PER	NUM ⇨ R
☞ D > P		*	
P > D	*!	*	

(82) D + N

	L ⇦ DIR	L ⇦ PER	NUM ⇨ R
☞ D > N			
N > D	*!	*	*

The relativ ranking of L ⇦ DIR and L ⇦ PER is irrelevant since all else equal the number of violations of L ⇦ PER for D > P(N) are the same as for for P(N) > D (in one case P(N) violates L ⇦ PER, in the other D does), but P(N) > D additionally violates L ⇦ DIR.

6.3.2 Case Studies

Turkana

A straightforward case is the Nilo-Saharan language Turkana where the number marker follows the verb root while subject and direction marking precedes it, with the direction affix initial (Dimmendaal, 1983:122):

(83) *k-ì-ràm-e-tè* ‘you beat me’
DIR-2-beat-ASP-PL

This follows from any ranking of the constraints L ⇦ DIR , L ⇦ PER, and NUM ⇨ R if no other constraints interfere: Any order different from D > P > V > N will induce the same constraint violations plus additional ones:

(84)

	L ⇦ DIR	L ⇦ PER	NUM ⇨ R
☞ D > P > V > N		*	
P > D > V > N	*		
V > D > P > N	*	**	
N > V > D > P	**	***	***
N > V > P > D	***	***	***

It is also predicted that the number affix occurs on the right of the aspect affix in (83). Actually, L ⇦ PER has to be ranked higher than NUM ⇨ R , as in (84), to get the distribution of the 1pl marker *kì-* (Dimmendaal, 1983:122):[15]

(85) *kì-los-ì* ‘We go’
1pl-go-ASP

(86) shows how the correct order derives from the assumed ranking, while the opposite ranking of NUM ⇨ R and L ⇦ PER in (87) leads to an incorrect suffixal position for *kì-* (PN):

(86)

	L ⇦ DIR	L ⇦ PER	NUM ⇨ R
☞ D > PN > V		*	*
D > V > PN		**!	
PN > D > V	*!	*	**
V > D > PN	*!	***	
V > PN > D	*!*	***	*

[15]The direction marker *k-* is deleted before *k* for phonological reasons. See Dimmendaal (1983:122).

(87)

	L ⇦ DIR	NUM ⇨ R	L ⇦ PER
D > PN > V		*!	*
☞ D > V > PN			**
PN > D > V	*!	**	
V > D > PN	*!		**
V > PN > D	*!*	*	*

Menominee

In Menominee, both direction and simple person marking are suffixal. This is unexpected under the assumption that all relevant alignment constraints push direction marking to the left edge.

(88) *na·n-ϵ·-w-ak* ‘they fetch them’ (p. 152)
fetch-D-[+3]-3pl

What is worse, there seem to be affixes marking only person preceding the stem:

(89) *ne-na·n-a·-w* ‘I fetch him’ (p. 152)
1-fetch-D-[+3]

Indeed, there is a broad consensus in the literature that the pronominal prefixes in Algonquin languages are not standard agreement markers.

(cf. Halle and Marantz, 1993; Wunderlich, 1996). First, they appear only in the so-called independent order (see chapter 7). Second, they show positional freedoms which has led many researchers to treat them as pronominal clitics. An alternative analysis is adopted here to account for the fact that they are bound to the independent order: they are treated as portmanteaus expressing the feature [+in(dependent)] *and* agreement.

Whatever analysis we prefer, it is clear that there are no genuine agreement prefixes in Menominee, which might be the effect of a high-ranked alignment constraint aligning stems to the left edge. Crucially, the same analysis seems to be applicable to other cases of suffixal direction markers, Mapudungun (Grimes, 1985), Yurok (Robins, 1958) and Nocte (DeLancey, 1985)

As will be shown in 7.3.3, Menominee has an elaborated system of 6 different direction markers. All of these have the same position immediately after the verb, which shows the highly systematic nature of the proposed constraints.

Dumi

Dumi seems to be problematic in that there are prefixal and suffixal direction markers:

(90) a. *a-luph-a* ‘he/they see(s) you (sg.)’ (p. 110)
AGR-see-AGR

b. *lop-N-na* ‘I see you (sg.)’ (p. 109)
see-AGR-AGR

However, this difference corresponds to an unusual difference in the featural content of the two markers. -*N* in (90b) is restricted to 1sg predications. Thus, -*N* is subject to three constraints: L ⇦ DIR , L ⇦ PER, and NUM ⇨ R . The only agreement affixes that follow -*N* are number affixes such as -*a* in (90b), which results naturally from the ranking in (91) where -*N* is DN ([+1 +sg] [+Acc +2]) and -*a* N [-du]:

(91) 1sg → 2sg

	NUM ⇨ R	L ⇦ DIR	L ⇦ PER
☞ V > DN > N	*	*	*
V > N > DN	*	**!	**
DN > V > N	**!		**
DN > N > V	**!*		**

For *a*- (90b,a), which is not marked for number, NUM ⇨ R is irrelevant, and thus it is carried correctly on the extreme left by L ⇦ DIR and L ⇦ PER. A second problem in Dumi are apparent intransitive person/number markers that appear prefixally:

(92) a. *a-phɨk-ini* 'you (pl.) arise'
??-arise-[-1+pl]

b. *ham-phɨk-a* 'they arise' *(p. 97)*
??-arise-[-1+du]

As already assumed by van Driem and argued for more in detail in 7.3, *a-* in (92a) is the same affix as the direction marker in (90-a) which lacks an accusative feature in its second feature structure and is therefore also licensed in intransitive contexts. This also explains its position. More difficult is the case for *ham-* which never appears in transitive contexts. Nevertheless, this can be viewed as an argument for it being represented as a portmanteau: It is in complementary distribution with *a-* which extends to 3rd person subject forms in the transitive paradigm. This would follow straightforwardly if we represent *ham-* by something like [-1 +pl +Nom] [-2] and the independently motivated constraint BLOCK D argued for in 7.3. This is also consistent with the fact that *ham-* must be case-marked: in Dumi, as in other languages of the same type, only direction markers are marked for case. However, this account leaves open the question why *ham-*, which is marked for a number feature, does not surface suffixally as *-N* in (90-b). What we have to assume is a split of constraints. Thus, L ⇦ DIR could be coupled with a crucially un-dominated constraint that targets only direction markers with a [+Nom] specification. Since this is the case for *a*- and *ham*-, but not for -*N*, the desired contrast follows. A second possibility would be to differentiate NUM ➪ R into SG ➪ R and PL ➪ R , as discussed in 6.2.5. I leave this possibility open.

6.4 The Relative Order of Subject Agreement and other Categories

6.4.1 The Affixal Status of Tense and SAgr

In DM, it is assumed that SAgr is standardly attached to Tense (Halle and Marantz, 1993:146). If this is true, it should be reflected in the position of AGR w.r.t Tense. To test this, I checked the precedence patterns for Tense and agreement affixes in my language survey. As is shown in (93), in more than 2/3 of the patterns for an Tense affix there is a corresponding agreement affix that has the same affixal status (”S” stands in the following for subject agreement):

(93) Affixal status of SAgr depending on the status of Tense

	T suffix	T prefix	all
SAgr conform	48 71.6%	19 70.4%	67 71.3%
SAgr not conform	19 28.4%	8 29.6%	27 28.7%
sum	67	27	94

These results are also supported by the data of Julien (2000:360):

(94) Affixal status of SAgr depending on the status of Tense (Julien, 2000)

	T suffix	T prefix	all
SAgr conform	80 58.4%	23 71.9%	103 60.9%
SAgr not conform	57 41.6%	9 28.1%	66 39.1%
sum	137	32	169

I propose to account for the tendency that SAgr is on the same side of the stem as Tense by a constraint REFLECT AGR which requires that SAgr appears right- adjacent to the tense marker. Neglecting for simplicity the sub-constraints of NUM ➪ R and L ⇦ PER, this gives the possible rankings in (95) if Tense is a suffix, and the ones in (96) if it is a prefix:

(95) Tense suffix

	Ranking	Affixal Status
☞ V > T > S	REFLECT AGR ≫ ...	conform
☞ V > T > S	NUM ➪ R ≫ ...	conform
☞ S > V > T	L ⇦ PER ≫ ...	not conform

(96) Tense prefix

	Ranking	Affixal status
☞ T > S > V	REFLECT AGR ≫ ...	conform
☞ S > T > V	L ⇦ PER ≫ ...	conform
☞ T > V > S	NUM ➪ R ≫ ...	not conform

NUM ➪ R and L ⇦ PER alone would predict that SAgr could equally well appear as a prefix or a suffix in any constellation. Since REFLECT always favors conform order, rankings requiring conforming SAgr and Tense affixes are more frequent, but there is always a ranking which results in non-conformity.

This account makes two further predictions: First, if Tense and S are both prefixes, S > T and T > S should be distributed rather evenly. And, second, the order V > S > T should be completely excluded. These points will be discussed in the next two sections.

6.4.2 The Order of Tense and SAgr in Prefixal Position

In my language sample (first column in (97)), I found that the order T > S is actually more frequent than S > T. However, this is contradicted by the results of Julien (2000:360) which finds the opposite distribution (second column).

(97) Affixal status of SAgr and Tense as Prefixes

	my results	Julien's Evaluation	Julien's data
T > S	12 63.2%	9 39.1%	17 47.2%
S > T	7 36.8%	14 60.9%	19 52.8%
sum	19	23	36

Note that the data from Julien do not refer to languages, but to genera in the sense of Dryer (1992). So, part of the difference might be due to the different sampling methods. There are, however, two further differences that might be responsible. First, Julien seems often not to register multiple patterns of agreement. Thus, in her appendix II, she finds only one agreement suffix for Somali (p. 440). For Island Kiwai, she gives the pattern Q+SPers+V+ONum+A+T+Snum (p. 445) even though she discusses data that clearly show further patterns such as

SPers T SNum V (p. 410).

Second, Julien claims to have "tried to distinguish between true agreement markers, which may occur with a DP argument and incorporated pronouns, which may not. Argument markers of the latter type are left out of discussion" (p. 360). Evaluating the data from Julien's appendix II (p.436 ff.), one gets much more cases of T,S > V and the distribution of T > S and S > T is almost equilibrated. (column 3 of (97)).[16] Under a rigid interpretation of her method, it might lead to a partial elimination of languages of the polysynthetic type, where T > S is relatively frequent (see 6.1 for a discussion of agreement in this type of languages). For the moment, I will take it for granted that both T > S and S > T are well attested, which follows from the assumed constraints.

6.4.3 The Order of Tense and SAgr in Suffixal Position

According to the assumed constraint set, in suffixal position, agreement should always follow Tense. This is true in the large majority of patterns:

[16]In (97), I only considered data which were marked by Julien as SAgr or as SPers SPl etc. but not where she explicitly writes SPron (subject pronoun).

(98) Affixal status of SAgr and Tense as Suffixes

	my results	Julien's data
V > T > S	41 85.4%	64 80%
V > S > T	7 14.6%	16 20%
sum	48	80

However, there *are* cases of the order V > S > T. Some of these – at least in my sample – are due to special properties of single affixes. Thus, the Quechua plural affix was argued to have the context restriction /V___ in 6.2.6 and therefore always precedes Tense. A similar case is the 1sg marker in Choktaw which always marks another head, which explains also its deviant position (see 6.5.3). A second class of exceptions are languages with the order: V A_1 T A_2. An example is Dumi:

(99) *phɨk-kɨ-t-a* 'we (exc.) get up' (p. 96)
get:up-[+1+pl]-NPast-[-du]

Note that the offending -*kɨ* only appears together with a second number affix that appears after the Tense marker. A plausible account is that a blocking constraint allows only one number marker on the right of Tense. This forces the 1st plural marker in the second-best position to the left of Tense:

(100)

	BLOCK [NUM]	du ➪ R	pl ➪ R
☞ [1pl] T [du]			**
[du] T [1pl]		*!*	
T [1pl] [du]	*!		*
T [du] [1pl]	*!	*	

A similar account can be given for Island Kiwai (see 6.5.3). Finally, there seem to be languages where SAgr is adjoined to a non-tense head.[17] This seems to hold in Menominee where agreement in certain contexts precedes the Tense marker *-epa(ni)* (*-epa* is followed by euphonic *-h* (in verbs) or *-q* (after pronouns and negators) if it would otherwise become word-final):

(101) *ke-pia-m-epa-h* 'you came' (p. 163)
[+2]-come-[-3]-PAST-h

Whatever the correct analysis for *-epa(ni)* is, it cannot be a spell-out of the head to which agreement in Menominee is attached. In negation contexts, *-epa* is suffixed to the independent negator while agreement still resides on the verb (the initial *e* of *-epa* is deleted after *a*):

[17] This conclusion is drawn for independent reasons in Julien (2000:214).

(102) *ka-pa-q pia-n-an*
NEG-PAST come-PER-NEG
'but he was not coming' (p. 197)

Note that there are two negation items in Menominee, one suffixed to the verb (-*an*), the other a freestanding word (*kan*) preceding and not necessarily adjacent to it.

(103) *kan so·h okε·ceqtanan enohahkuahko·hsεh*
not by:any:means that:woodchuck comes:forth
not by any means does that woodchuck come forth. (p. 474)

Thus, while the model developed in this section assumes that there is always one Tense head in a language, and that SAgr is attached to it, these assumptions seem to have exceptions, which makes the model quite tentative. Clearly, more work has to be done on the relation of SAgr and its hosts in different languages.

6.4.4 The Order of Tense and SAgr in Mixed Positions

Siewierska (1993:68) makes the observation already cited in 5.2.1 that

(104) "if SAgr is a suffix so is the tense marker."

Siewierska finds that this is true for 91% of the languages from a sample of 262 languages.[18]

(105) The relationship between the form of SAgr and tense affix

N=262	Tense suff N=188	Tense pref N=60	Tense both N=14
SAgr suff N=112	102 91%	9 8%	1 1%
SAgr pref N=116	68 57%	41 35%	7 6%
SAgr both N=34	18 53%	10 29%	6 18%

(106) Order of SAgr and Tense (Mixed cases)

	Siewierska	Julien	my data
S > V > T	68 88.3%	57 86.4 %	19 70.4%
T > V > S	9 11.7%	9 13.6%	8 29.6%
sum	77	66	27

[18]Actually Siewierska's sample contains 308 languages. 262 is the number of them that exhibit both agreement and tense inflection.

This result seems to be problematic since – according to the proposed constraints – S > V > T given suffixal T, and T > V > S given prefixal T are equally probable. In each case, alignment constraints can be said to outrank REFLECT and COHERENCE.

However, suffixal T is much more frequent than prefixal one (Julien, 2000:51 ff.). Especially in the patterns involving Tense and SAgr, suffixal Tense is far more frequent. This is true in my data for 75 of 107 patterns (70%) and for Julien's data in 127 out of 172 (79.6%) Thus, the distribution of T and S in mixed cases seems to follow from the independent distribution of T alone.

6.4.5 Ordering of SAgr and Non-Tense Categories

A further open question are the ordering relations of subject agreement w.r.t. other categories such as aspect or mood. While I will not have to say any substantive on the topic here, note that for aspect, orders can be found that are unusual for tense. Thus, in Kanuri, we have the order V SAgr Aspect or Aspect V SAgr (see (54)). The ordering of aspect and agreement cannot be completely separated since we find interspersing of aspect and agreement as in Somali or Dumi:

(107) *keen-t-aa-n*
bring-2-PRS-PL
'you (pl.) bring' (Somali; El-Solami-Mewis, 1987:75)

(108) *dziː-k-t-a*
talk-S1p-Npast-SNdu
'We (exc.) talk' (Dumi; van Driem, 1993:97)

A conclusive account would presuppose an answer to the question to which heads SAgr is attached in these languages. I will leave the question open here.

6.5 Affixal Status

In section 5.2.1, it was observed that the DMM implies the uniformity in affixal status of single affixes – I will call this "narrow uniformity" – but does not make any predictions on similar affixes realizing the same head such as different agreement affixes. The latter phenomenon will be called here "wide uniformity". In this section, I show how both types of Uniformity and exceptions to them follow from the proposed constraint inventory.

6.5.1 Narrow Uniformity

For Tense affixes, there is a simple answer[19] why they should always be on the same side of the stem: Tense formatives are affixes only in as far as they show fixed positions. Items that occur freely in changing positions w.r.t. stems will simply not be perceived as affixes. Note that lexical heads can also be regarded as affixes by native speakers if they are standardly bound to a stem, but still have some positional freedom. This is the case with separable prefixes in Hungarian and German (see Lüdeling (2001) for a recent treatment). Hence, Tense affixes should have uniform affixal status in the general case, but not without exceptions.

For agreement affixes, we can state a more formal reason why a certain affix will normally always appear in the same stem-position: All alignment constraints refer to the affixes or their underlying content not to other cooccurring heads. Thus, there is no constraint of the type “Agr should be on the left of a mood marker which would mean that (even the same) SAgr could be suffixal if a mood marker is present while prefixal if none is. Such cases indeed exist but only very rarely and I will assume that they are due to language-specific constraints. The only universal constraint that makes affix position dependent from

[19] Cf. Julien (2000:38) and 5.3.

any other item is REFLECT. Thus, if the Tense head to which SAgr attaches has different positions, this could also be true for SAgr affixes. We will see that nearly all cases where one affix has different positions w.r.t the stem can be accounted for by reference to the tense head to which agreement is attached.

6.5.2 Wide Uniformity

Here are again the data from Siewierska in (8) that show uniformity of affixal status to be a strong tendency even in the wider sense:

(109) The relationship between the form of SAgr and Tense affix

N=262	Tense suff N=188	Tense pref N=60	Tense both N=14(5%)
SAgr suff N=112	102 91%	9 8%	1 1%
SAgr pref N=116	68 57%	41 35%	7 6%
SAgr both N=34(13%)	18 53%	10 29%	6 18%

Wide Uniformity follows from the fact that general constraints such as L ⇦ PER and REFLECT normally hold for *all* subject affixes. Even though no general constraint of this type is ranked high enough to force common behavior of all affixes, the existing sub-constraints of PER and NUM will drag similar affixes in the same directions since sub-constraints align to the same edge as the "super-constraint". Assume as an example a hypothetical language with suffixal tense markers and two affixes one is marked [+1] and the other [+2].

(110) Rankings

			[+1]	[+2]	Number
R	$\gg$ PER,1,2		V T [+1]	V T [+2]	6
PER	$\gg$ R,1,2		[+1] V T	[+2] V T	6
1	$\gg$ 2	$\gg$ R,PER	[+1] V T	[+2] V T	2
*1	$\gg$ PER	$\gg$ R,2	[+1] V T	V T [+2]	2
*1	$\gg$ R	$\gg$ PER,2	[+1] V T	V T [+2]	2
2	$\gg$ 1	$\gg$ R,PER	[+1] V T	[+2] V T	2
*	$\gg$ PER	$\gg$ R,1	[+1] V T	V T [+2]	2
*2	$\gg$ R	$\gg$ PER,1	[+1] V T	V T [+2]	2
					24

The alignment constraints are abbreviated by the features they align. Thus, “2” stands for L ⇦ 2. R stands for REFLECT. There are 24 different rankings, but only 8 of them lead to non-uniformity. In other words, violations of wide uniformity are possible, but rare:

6.5.3 Violations of Uniformity

On the other hand, violations of *Narrow* Uniformity are largely unexpected and need further consideration. The same is true for cases where there are two affixes with different affixal status but identical feature specifications, which should behave uniformly w.r.t. all relevant constraints.

Apparent Non-Uniformity: Anywa

In some instances, apparent violation of narrow uniformity is due to pronouns which are mis-analyzed as agreement markers. Thus, in Anywa, following the description of Reh (1993), the same agreement markers[20] can appear suffixally or prefixally, depending on the syntactic context, which is unexpected given the proposed constraints:

(111) a. ˈ***āan***-*ā-tèeDó.* ‘I cooked’ (p. 190)
S1-PST-cook:PD

[20] Differing only in morphophonological detail See (Reh, 1993:192 ff.).

b. *ā-mááDH-**á*** 'I drank it' (p. 193)
PST-drink-S1

While Reh's description is in many points unclear, it seems that the alleged agreement markers are really weak pronouns. Thus, they can only be used prefixally in what Reh calls "NP-initial clauses", where they are in complementary distribution with full NPs:

(112) a. *wàaŋì lwʌ̀ʌr*
grandmother:his be:afraid
'His grandmother is afraid'

b. *gī-lwʌ̀ʌr*
3pl-be:afraid
'They are afraid' (p. 311)

A sentence like (112b) can only be called "NP-initial" if *gī-* is a pronoun, not an agreement marker. Equally, the fact that in verb-initial sentences only suffixed "agreement is possible" is explained if these are really pronouns. A further point showing that these items are pronouns is their optionality. Thus, the 3sg marker can be omitted in NP-initial (113a) as well as in VP-initial (113b) sentences:

(113) a. *lwʌ̀ʌr*
be:afraid
'He is afraid' (p. 311)

b. *óo mı̀ɛ́l jɔ́wwí*
and dance people:DEF
'and the people dance' (p. 313)

For pronouns it is a standard option to be pro-dropped while agreement is normally obligatory. The only situation where these pronouns seem to be really obligatory (for marking 3rd per reference) is when a subject NP is moved into sentence-initial position over a preverbal object NP:

(114) *ó dìmó tɔ́ŋ wʌnní ā-kwáa-ɛ́.*
son:mN Dimo spear:mN uncle:his PA-ask:for-3S
'Dimo's son asked for his uncle's spear' (p. 312)

But this reminds more on anaphoric resumption of a left-dislocated NP than agreement. In sum, the person markers in Anywa are pronouns morphophonologically forming a unit with verbs and form no genuine violation of Uniformity.

Non-Uniformity of Allomorphs: Choktaw, Amharic, Teda

In Choktaw (Broadwell, 2000), all agreement markers are prefixal except the 1sg marker *-li*:

(115) a. *II-pisa-tok* 'we saw (him)'
1pl-see-PAST

b. *pisa-li-tok* 'I saw (him)' (p. 27,28)
see-1sg-PAST

While this is non-uniformity, it is wide uniformity, hence it can in principle be accounted for by the assumed constraints. More problematic is the fact that in negative forms a different set of affixes appears, and the suffix *-li* is replaced by the prefix *Ak-*:

(116) *Ak-iiya-okii-ttok* 'I didn't go' (p. 24)
1sg-go-NEG-PAST

But since *Ak-* is also a 1sg marker, i.e. an allomorph of *-li*, it should be also a suffix if this is the optimal position for *-li*. Interestingly, the negative affix occupies exactly the same position as the 'deviant' agreement marker *-li* after the verb stem and before a possible causative affix and Tense markers. Since *-li* is also in complementary distribution with negation, it is natural to assume that it is a portmanteau realizing the syntactic head which also negation instantiates (the positive value of the Sigma projection in terms of Laka (1990)). Since negation is a contentful head, its positioning is unviolably determined by syntactic configurations. For the rest, Choktaw can simply be said to be governed by a high-ranked L ⇦ PER . A similar account is plausible for Amharic, where the marker for the 2sg masc is *të-* in imperfective and *-h* in perfective forms:

(117)	a.	***tə-***_säbər_ ??-break	'you (sg.) break (impf.)'
	b.	_säbbär-**h**_ break-??	'you (sg.) broke (perf.)'

I let aside the possibility that both might encode slightly different sets of agreement features. Since there is no other affixal reflex of aspect, -*h* can be argued to be a portmanteau that realizes agreement and the perfective aspect head, which fixes its position. In contrast, *të-* by assumption a simple person marker reflects the alignment of person features to the left edge.

While in the cases discussed so far non-uniform affixes were argued not to be real allomorphs, since one of the offending pair could be analyzed as a portmanteau marker, this option is not available in Teda, where otherwise identical allomorphs behave non-uniformly w.r.t. affixal status but allomorphy is triggered by the stem class of the verb, not the presence of a third head (118).

The order of plural w.r.t. person affixes was already discussed in 6.2.6. The separation of person and number makes it probable that the corresponding 1st and 2nd person affixes have exactly the same content, i.e. are not differentiated by different number features. I assume that the unusual position of -*ər* and -*əm* is due to a high-ranked constraint that aligns verbal stems to the left but is ranked below L ⇦ 3.

(118) Teda (Bryan and Tucker, 1966:184,185)

	'lie down'		*'do'*	
1sg	*t-iʃ*	*P-V*	*kɔs-ər*	*V-P*
2sg	*n-iʃ*	*P-V*	*kɔs-əm*	*V-P*
3sg	*y-iʃ*	*P-V*	*yə-gɔs*	*P-V*
1sg	*t-iʃ-ọ*	*P-V-N*	*kɔs-ed-ər*	*V-P-N*
2sg	*n-iʃ-ọ*	*P-V-N*	*kɔs-ed-əm*	*V-P-N*
3sg	*y-iʃ-ọ*	*P-V-N*	*yə-gɔs-o*	*P-V-N*

How can we then account for the difference between the 1st and 2nd person markers? I propose that *t-* and *n-*, as the plural markers, are semi-bound affixes (cf. 6.2.6). A context restriction for these items is independently needed to account for their appearance instead of the corresponding agreement suffixes. Note that this analysis requires that CONTEXT-MAXIMIZATION is ranked higher than the alignment constraints responsible for the positioning of the agreement suffixes, since otherwise we would get the suffixes even if these have no context restrictions.

Island Kiwai

In Island Kiwai (Wurm, 1975), person markers are always prefixal while number markers appear as suffixes in certain tenses and as prefixes in others. This is shown in (119) with the dual affix -*do* in 1st du forms. In parentheses you find the respective tense markers:

(119) Kiwai 1du forms

PRESENT (-duru)	NEAR PAST (-Ø)	DEF. PAST (-ru)	IMM.FUT. (-ri)	INDEF.FUT. (du- -ri)
n-V-*duru*-**do**	*n*-V-**do**	*n*-V-*ru*-**-do**	*ni*-**do-**V-*ri*	*ni*-*du*-**do-**V-*ri*

The orders for the PRESENT and the INDEF.FUT follow straightforwardly if SAgr is attached to the head spelled out as -*duru* in the PRESENT and to the head represented as -*du* in the INDEF.FUT:

(120) V [+Tense] [+1 +du] (PRESENT)

	L ⇦ PER	REFLECT	du ⇨ R
☞ n-V-duru-do			
n-do-V-duru		*!	**
V-duru-n-do	*!*		
do-V-duru-n	*!**		***

(121) [+Tense] [+1 +du] V [+Tense2] (INDEF.FUT)

	L ⇦ PER	REFLECT	du ⇨ R
☞ ni-du-do-V-ri			**
ni-do-du-V-ri		*!	***
du-ni-do-V-ri	*!		**
ni-du-V-ri-do		*!	**

Things are somewhat complicated by trial forms which are marked by the trial affix *bi* and the plural affix *mo*:

(122) Kiwai 1st trial forms

PRESENT (-duru)	NEAR PAST (-Ø)	DEF. PAST (-ru)	IMM.FUT. (-ri)	INDEF.FUT. (du- -ri)
n-V-**bi**-*duru*-**mo**	*n*-V--**bi**-*ru*-**mo**	*n*-V-**bi**-*ru*-**mo**	*ni*-**mo**-V-**bi**-*ri*	*ni*-*du*-**mo**-V-**bi**-*ri*

Assuming that only one affix is allowed on the right of Tense by a blocking constraint, and that pl ⇨ R is ranked over tri ⇨ R , we get the right results:

(123) V [+Tense] [+1 +pl +tri] (PRESENT)

	L ⇦ PER	BLOCK	REFLECT	pl ⇨ R	tri ⇨ R
☞ n-V-bi-duru-mo					**
n-V-mo-duru-bi				*!*	
n-V-duru-bi-mo		*!			*
n-V-bi-mo-duru			*!	*	**

(124) [+Tense] [+1 +pl +tri] V [+Tense2] (INDEF.FUT)

	L ⇦ PER	BLOCK	REFLECT	pl ⇨ R	tri ⇨ R
☞ ni-bi-du-mo-V-ri				**	****
du-ni-V-bi-ri-mo	*!				**
ni-du-V-bi-ri-mo			*!		**
ni-mo-du-bi-V-ri				***!*	**

The account for the DEF. PAST works in all crucial respects as that for the PRESENT. This also holds for the NEAR PAST with the only addendum that REFLECT is irrelevant here. Somewhat problematic is the IMM.FUTURE because the number markers appear prefixally, even if there is no overt tense marker here. This might be evidence that REFLECT must be extended so that AGR markers have also to reflect the position of their hosts even though the hosts themselves are not overtly expressed by an affix.

Kanuri

In section 6.2.5 we saw already how in Kanuri differentiation of person alignments leads to a violation of wide uniformity. The relevant data from (54) are repeated here:

(125) Kanuri

1sg	*lad-é-**k**-in*	**1pl**	*lad-í-**ye**-n*
2sg	*lad-é-**m**-in*	**2pl**	*lad-ú-**w**-in*
3sg	***se**-lad-în*	**3pl**	***s-a**-lad-în*

However, there are also stems where the 3rd person marker *se-* and the plural marker *a-* become suffixal:

(126) *wú-z-à* 'they look at (it)' (p. 186)
look:at-3-PL

Crucially, these stems are inflected by attaching the corresponding verb *n* 'think' to it, which is more obvious in the non-3rd person forms:

(127) *wû-n-yè* 'we look at (it)' (p. 186)
look:at-think-1pl

It is plausible that *n* in (126) has been deleted by a morphophonological process after *-z-à*. While it is clear that *n* is distinct in this use from its independent use as a lexical verb, i.e. it is a light verb or the realization of an INFl category, it is not obvious what the relevant spell-out domain is. If *n* and adjoined agreement form a separate domain, the order facts follow immediately since all affixes then have the same affixal status as in (125). If the lexical verb is part of the spell-out domain, we could assume that verbs of the class of *wû* are aligned by a high-ranked constraint to the left while *n* and other verbs are not subject to this constraint.

Fula

Stump (1993a) discusses two cases from Fula[21] where the same affixes appear suffixally or prefixally according to factors such as Tense and negation marking. For the sake of completeness, here also a case is treated which does not directly involve agreement and is shown to derive plausibly from movement. The first such case is the Tense marker

[21]Stump also analyses Swahili relative markers which I do not discuss here. They too can be analyzed along the lines I propose for Fula.

no(o)- which appears suffixally in the “General Past” (128a), but prefixally in the “1st continuous” Tense (128b):

(128) a. *'o-warii-no* ‘he had come’
S3s-come:TNS-PRET

b. *'oδon-no-wara* ‘he was coming’ (p. 141)
S3s-PRET-come:TNS

In this case, we might hypothesize that it is the result of verb movement. The aspect/tense head spelled-out *-no* might plausibly force (attract) the complex [V -ii] to move (128a) while it does not attract the Tense head present in (128b).

A complex case which involves violation of uniformity in agreement is the order of subject and object agreement markers in Fula. Note first that certain subject agreement affixes appear suffixally in specific tense/mood combinations and prefixally in others (Arnott, 1970:191-192):

(129) Fula

	General Past	**Relative Past**	**Subjunctive**
1sg	***mi***-*loot-ii*	*loot-u-* ***mi***	***mi***-*loot-a*
2sg	***'a***-*loot-ii*	*loot-u-* δ***aa***	*loot*-***aa***
3sg	***'o***-*loot-ii*	***'o***-*loot-i*	***'o***-*loot-a*
1pl	***min***-*loot-ii*	***min***-*loot-i*	***min***-*loot-a*
2pl-exc.	***'on***-*loot-ii*	*lootu-u-* δ***on***	*loot-* ***on***
2pl-inc.	***'en***-*loot-ii*	*loot-u-* δ***en***	*loot-* ***en***
3pl	β***e***-*loot-ii*	β***e***-*loot-i*	β***e***-*loot*

The situation is obscured by the fact that there are multiple possibly cooccurring Tense heads in Fula, but the order in the General past can be clearly made to follow from a high-ranked L ⇦ PER(SUB) . Problematic are the markers that follow all suffixal Tense marking and precede object agreement in the specified cases:

(130) *taw-no-*δ*aa-mo*
find:RPast:ACT-PRET-you-him
'you had found him' (p. 218)

Of course, this is also an expected order assuming that SAgr is attached to a suffixal Tense head and REFLECT is high-ranked. What we have to say is that REFLECT is restricted in Fula to 2nd person agreement and to certain tense/mood combinations. Still another constraint is necessary for the 1sg-marker *mi*- which appears suffixally in somewhat different contexts than the 2nd person markers and also behaves differently w.r.t. object marking. While *mi* occurs before object marking with plural object markers (131a), it appears after them with singular markers (131b):

(131) a. *mball-u-(noo)-**mi**-ɓe*
help-REL:PAST:ACT-(PRET-)-I-them
'I had helped them'

b. *mball-u-(no)-moo-**mi***
help-REL:PAST:ACT-(PRET-)-him-I
'I had helped him' (Stump:165)

Thus, I assume a further constraint 1sg ⇨ R // Relative PAST. If there is a special constraint OBJ NUM ⇨ R , as speculated in 6.2.5, this is higher ranked than 1sg ⇨ R, and object singular markers are unspecified for number, this accounts for the behavior of *mi*:

(132) 1sg → 3sg (132a)

	ONUM ➪ R	S1sg ➪ R	L ⇦ SPER
V mi O3sg		*!	*
☞ V O3sg mi			**
mi V O3sg		*!*	

(133) 1sg → 3pl (133b)

	ONUM ➪ R	S1sg ➪ R	L ⇦ SPER
☞ V mi O3pl		*	*
V O3pl mi	*!		**
mi V O3pl	*!	**	

The complete Ranking that is required for the Fula data is:

(134) ONUM ➪ R $\gg$
S1sg ➪ R , Reflect (S2, TENSE) $\gg$
L ⇦ SPER

While there is something idiosyncratic about these facts, ONUM ➪ R and L ⇦ SPER are plausible candidates for universal constraints. This is also true for REFLECT (S2, TENSE) which is only restricted here in range. So, the only fact that completely runs counter to the general approach is the behavior of *mi*. But even this is restricted to a special Tense and can be expressed in a minimal way, by a high-ranked constraint, giving rise in most contexts to Emergence of the Unmarked.

Compare this to the analysis of Stump (1993a). He assumes a model of Dash and Mirror position classes, i.e. affixes of a certain position class always occur nearer to the stem than those of a higher position class, but the affixal status of an affix is stipulated by the rules (so-called "Morpholexical rules, MLRs) which introduce a particular affix. Thus (135) introduces *mi* as a prefix:

(135) $\text{MLR}_{[AGR(su):1sg]}$ $([_V\ x]) =_{def} [_V\ mi\ [_V\ x]]$

The general problems of this approach were already discussed in 5.4.2. Here, I will only consider how it deals with the problematic ordering of *mi* and 2nd person affixes. Since MLRs can only prefix or suffix material, but not leave the position of an introduced affix open, Stump would need a second rule that generates *mi* as a suffix. To come around this problem, Stump introduces the new device of meta-rules which map rules to rules. Thus (136) maps (135) to the corresponding rule for suffixal *mi*:[22]

[22](136) is modeled after a similar rule for a Swahili agreement affix in Stump (1993a:146) (30F).

(136) $\text{MLR}_{[AGR(su):1sg]}\ ([_V\ x]) =_{def}\ [_V\ x\ [_V\ y]] \Rightarrow$

$\text{MLR}\ _{[AGR(su):1sg,TNS:relative\,past]}\ ([_V\ x]) =_{def}\ [_V[_V\ y\ ]\ x]]$

Finally, to get the order of *mi* and the sg object affixes right, Stump assumes that position classes can be relativized w.r.t. the feature content of a verb form. In other terms, to account for the order [[[V] mi] O3pl] he takes the default order V I II, where I is the position class of *mi* and II that of Object markers. For a 1sg subject and singular object, position classes are ordered in a different way namely V II I, which predicts correctly [[[V] O3sg] mi]. To be sure, there are three different stipulations here, necessary to account for the behavior of *mi* 1) its standard position as a prefix, 2) a metarule and 3) changing position classes. Especially the last, but also the second can be seen as last-resort extensions of the rule-based account to deal with these cases. In DO, a single constraint suffices to get the effect of all these devices. Moreover, this is technically exactly of the same type as all other constraints in DO. So, contrary to the rule-based account, no formal extras are needed.[23]

[23]In the appendix, Stump proposes to fix affixal status by defaults.

6.5.4 An Open Problem: Consistently Suffixal Agreement

At several points of this chapter, we encountered cases where all types of agreement even pure person markers are realized as suffixes:

(137)

Kanuri	**Somali**	**Menominee**
lè-zə go-3 'he goes'	*keen-t-aa-n* bring-2-ASP 'you (fem.) bring'	*po·se-w-ak* embark-3 'he embarks'
lè-z-â go-3-PL 'they go'	*keen-t-aa-n* bring-2-ASP-PL 'you (pl.) bring'	*po·se-w-ak* embark-3-3pl 'they embark'

Note that the plural forms are unproblematic. High-ranked PL ➪ R and COHERENCE could ensure the suffixal position for all agreement markers. However, this cannot be true for the singular forms where no overt plural marker is present. All constraints referring to person align these affixes to the left which would predict a prefixal position. REFLECT cannot be responsible for their position either since they are not right-adjacent to any other functional category. One possible solution would be to assume a constraint requiring paradigm uniformity, that requires affixes to have the same position in different forms. But this requires a new constraint type, whose interpretation is not unproblematic in a framework adopting post-syntactic morphology.

The most straightforward account under my premises is to generalize the analysis considered for Kanuri in 6.5.3, where it is plausible that the suffixes are part of a post-verbal AUX constituents. A similar effect could be achieved by extending REFLECT AGR to cases where no overt realization of the host is present (see the discussion of Kiwai in 6.5.3). Since in all the cases involved the host is problematic, we could assume a "silent" Tense head here.

Some evidence for this claim is found in Menominee conjunct order forms where past is not expressed by an affix but by the so-called initial change, "an accretion or lengthening in the first syllable" (Bloomfield, 1962:54):

(138)	a.	*pia-t* come-[+3]	*'when he comes'*
	b.	*p**ay**ia-t* come-[+3]	*'when he came'*

Since Tense and V are here phonologically fused, it is plausible that this corresponds at the morphosyntactic level to the structure [[V]Tense]Agr]. The affix *-epani* discussed in 6.4.3 would then be the spell-out of a higher Tense head while SAgr is attached to the lower one not visible in independent-order forms.

A final possibility is that SAgr in cases where it does not adjoin to Tense is directly merged with the verb. This would allow to derive the order of the problematic affixes even within the version of REFLECT proposed in chapter 3.

Chapter 7

A Minimalist Account of Agreement in Direction-Marking Languages

The typological literature (e.g. Comrie, 1980; DeLancey, 1985; Klaiman, 1992) typically assumes that languages with rich agreement morphology have the option to explicitly mark the (un-)naturalness of predication types w.r.t. (animacy) hierarchies by special affixes or the choice of particular paradigms.

For example, in the Algonquian language Menominee (Bloomfield, 1962), verbs standardly mark predications which involve 1st or 2nd person subjects and third person objects by the affix *-a·* and predications with 3rd person subjects and 1st/2nd person objects by *-ek(o)*:

(1) a. *ne-na·n-**a·**-w-enaw-ak*
1-fetch-D-[+3]-[+1+pl]-[-1+pl]
'we (exc.) fetch them' (p. 153)

b. *ne-na·n-**ek**-w-enaw-ak (nena·nekonawak)*
1-fetch-D-[+3]-[+1+pl]-[-1+pl]
'they fetch us (exc.)' (p. 154)

In terms of the Algonquianist literature (Hockett, 1966), *-a·* marks a "direct" situation since a speech act participant is supposed to be a more "natural" subject than a 3rd person argument while *-eko* – which appears in the inverse case – marks an "inverse" constellation. Both types of morphological marking are referred to by the term "direction marking". This terminology was later carried over to many other languages. Here is a representative statement from (Comrie, 1980):

(2) "Languages which have an opposition between direct and inverse verb forms build directly upon the animacy hierarchy: the **direct forms** are used when the subject of the transitive verb is

higher on the scale of animacy than the direct object, i.e., where the situation is of the expected kind. The **inverse form** is used when the subject is lower in animacy than the object, i.e. for the unexpected kind of situation" (p. 62).

The animacy hierarchy[1] cited by Comrie typically has the form in (3a) or (3b):

(3) **The Animacy Hierarchy:**

a. $2 > 1 > 3 >$ inanimate, **or**

b. $1 > 2 > 3 >$ inanimate

Based on such a hierarchy, which can be viewed as a linear order $A_1 > \ldots > A_n$ on the set of possible agreement categories, more explicit accounts, such as Klaiman (1992), formulate rules of direction marking in a way schematized in (4):

(4) In a transitive predication,
involving the arguments $A_x, A_y, 1 \leq x, y \leq n$:
If $A_1 > A_2$ (inverse relation) do X
(and if $A_2 > A_1$ (direct relation) do Y)

[1]DeLancey (1985) calls such hierarchies "empathy hierarchies".

where X and Y are operations such as "insert a direct/inverse marker", "choose a special kind of paradigm" or "passivize the sentence" etc.

In this chapter, I will relate direction marking to two other phenomena that are typical for these languages: Agreement affixes not specified for case which compete for feature realization (7.2) and the blocking of feature realization in certain transitive predications. Both phenomena are again based on properties like person and animacy. As the reader might suspect, these phenomena will be captured by the interaction of PARSE and blocking/impoverishment constraints. This account is then shown to carry over naturally to direction markers themselves if these are conceived as portmanteau affixes encoding transitivity and minimal additional information (7.3). Section 7.4 extends the account to languages which show direction marking in a wider sense. The chapter starts with some remarks on Menominee, which will be the main focus of the discussion (7.1) and concludes with a short summary (7.5).

The basic theoretical claim behind this analysis is that it obviates any direct representation of feature hierarchies in particular grammars as well as explicit rules or representations which refer to them. This approach is minimalist in the sense that no other representations or constraint types are needed than those independently needed in OT-morphology. However, this is not to say that feature hierarchies play no role in direction marking: They are reflected in specific constraints and constraint rankings.

7.1 Menominee and the Unity of Direction Marking

While there is a considerable amount of typologically oriented literature on direction marking, languages of this type have had few systematical attention in generative approaches to morphology. A notable exception are Algonquian languages which were first introduced into the theoretical discussion by Anderson (1992) who used data from Potawatomi to show the advantages of an affixless approach to morphology. Steele (1995) claims to give a more insightful account in terms of a lexicalist, still processual, model. Halle and Marantz (1993) reanalyze the same and additional data in a derivational version of Distributed Morphology, followed by McGinnis (1995) who modifies their analysis in crucial respects for an account of Ojibwa. Wunderlich (1996) following Fabri's 1996 analysis of Plains Cree gives a short analysis in the framework of Minimalist Morphology, relying crucially on the explicit reference to feature hierarchies in lexical items. All the languages treated in these works are closely related but differ considerably in morphological details. My reason to treat in this thesis

Menominee, still another closely related language, is the availability of a source of unique descriptive and analytical quality, the grammar of Bloomfield (1962). As Hockett, the primary source for Potawatomi, puts it, discussing a treatment of his own data by Pike and Erickson (1964):

(5) "If exercises in restatement have methodological or theoretical aims, then they should be based on the best and fullest available primary reports, not on anything as full of holes as my sketch of Potawatomi ... Why did Pike and Erickson choose Potawatomi rather than Ojibwa or Menominee, on which Bloomfield's treatments - superbly full in the latter case - are now available?" (Hockett, 1966:73)

A comparative discussion of Algonquian languages is far beyond the scope of this chapter, and thus I will discuss other approaches for the most part only under the perspective how well they would carry over to Menominee. This is also justified by the fact that these treatments only discuss very restricted subsets of the verbal paradigm.[2] In effect, as far as I can see, my analysis of Menominee carries over mutandis

[2]Thus Anderson and Steele do not treat negated forms, and none of the cited works carries over to the conjunct-oder forms (see below).

mutatis to the discussed data sets from other Algonquian languages, while the reverse will be shown not to be true due to the limitations of the earlier analyses.

To get an idea of typical Menominee verb forms, look again at the examples from (1) repeated here as (6):

(6) a. *ne-na·n-**a**·-w-enaw-ak*
1-fetch-D-[+3]-[+1+pl]-[-1+pl]
'we (exc.) fetch them' (p. 153)

b. *ne-na·n-**ek**-w-enaw-ak (nena·nekonawak)*
1-fetch-D-[+3]-[+1+pl]-[-1+pl]
'they fetch us (exc.)' (p. 154)

These are identical apart from the direction markers ***-a·*** and ***-ek***. Thus, *-ak*, 3pl agrees with the object in (6a) but with the subject in (6b). A very simple account would state that subject and object have changed their place in (6b) through a syntactic operation which is indicated by inverse marking. Non-application of this operation would then by marked by ***-a·***. This view is advocated in Rhodes (1976) and Perlmutter and Rhodes (1988) but was nearly uniformly rejected in subsequent work on Algonquian, such as Dahlstrom (1986) on Cree,[3] since there is

[3]See also Klaiman (1992) and McGinnis (1999) for some more recent discussion.

few if any syntactic evidence for this claim. In what follows, I will take it as uncontroversial that direction marking in Algonquian is purely morphological in nature.

More traditional wisdom would simply state that -*w*, -*enaw* and -*ak* are markers for agreement features not differentiating subject and object, while direction markers express the basic relation between the two arguments. This is also the basic idea of my analysis: Direction markers parse case features of subject and object, while the other markers express additional features. Caseless affixes and direction markers thus form a natural unity in parsing input features. The richness of different markers provokes constraints against too much complexity, where more than one affix of a certain type is blocked according to feature hierarchies. In fact, all affixes in (6) are subject to such constraints, which makes Menominee an especially rich study ground for hierarchy-based competition.

As already mentioned, Menominee also has an abundantly complex system of direction marking, namely 5 different direction markers distributed in different ways in different morpho-syntactic contexts, such as affixal negation and verbal order. Order is a category Algonquianists use to differentiate a predicative verb paradigm (independent order) from a second one used in subordinate sentences (conjunct order) which is based in most respect on a different set of agreement affixes but uses the same set of direction markers:

(7) a. *ke-nε·w-e-m-waw*
2-see-D-[-3]-[-1+pl]
'you (pl.) see me' (independent order, p. 156)

b. *nε·w-e-yε-k*
see-D-[-3]-[-3+pl]
'when you (pl.) see me' (conjunct order, p. 156)

A second point that is crucial for the understanding of Algonquian morpho-syntax is the differentiation of 3rd person arguments illustrated in (8):

(8) a. *po·se-w(-ak)*
embark-[+3](-[+pl])
'he embarks' ('they embark', proximate, p. 150)

b. *po·se-w-an*
embark-[+3]-[+obv]
'the other embarks' (obviative, p. 150)

c. *po·se-n*
embark-[+per]
'there is embarking' (indefinite subject, p. 150)

d. *mεhki·-w(-an)*
be:red-[+3](-[+pl])
'it is red' ('they are red',inanimate, p. 151)

The first distinction is that between proximate (8a) and obviative (8b) NPs, where "proximate" corresponds roughly to NPs referring to topic information and "obviative" to NPs introducing new discourse referents. In transitive predications, either the subject or the object (but not both) are obviative. In the examples, following Bloomfield, obviative arguments will be glossed by the phrase "the other". I will assume – modifying slightly a proposal by Halle and Marantz (1993) – that the distinction is coded by a feature +/-obv, where obviatives are +obv while non-third person arguments and proximates are -obv.

The second relevant distinction is a gender-distinction between animate (8a,b,c) and inanimate arguments (8d). For convenience, I will again assume that 1st and second person arguments are [+an] and only inanimates are [-an].

Finally, subjects can be "indefinite", i.e. unspecified in a passive-like manner (8c). Bloomfield indeed calls these forms passives, and I will follow him here in the translations. However, the alleged passive forms are integrated in the inflectional system of transitive forms in so many respects that it makes more sense to treat them as unspecified actor forms. I will mark unspecified subjects by the specification [-def] in contrast to all other arguments. One further feature will be assumed without further motivation. Inanimate arguments and indefinite actors are often subject to the same constraints. I refer to the class formed by these two categories by the specification [+lrs] ("low referential status"). (9) shows the distribution of the assumed features:

(9)

	[+/-obv]	[+/-an]	[+/-def]	[+/-lrs]
1st/2nd person	-	+	+	-
3rd proximate	-	+	+	-
3rd obviative	+	+	+	-
inanimate	-	-	+	+
unspecified	-	+	-	+

7.2 Hierarchy-Based Competition

The aspect of direction marking languages that fits most obviously in an OT-framework are cases where person features compete for realization, and a feature hierarchy decides which one surfaces. This type of competition is easily captured in DO by the ranking of PARSE constraints which refer to the single features of the hierarchy. Note that in this analysis simple constraints do not make explicit reference to any hierarchy. Rather, the order of the hierarchy is carried over to the ranking of constraints. As a simple example, we start with the

Nilo-Saharan language Turkana.

7.2.1 Turkana

In Turkana, apart from direction marking to be discussed in section 7.3.2, finite verbs always bear exactly one person agreement affix, which marks subject agreement if the verb is intransitive, or both arguments are participants, or both are non-participants:

(10) a. *à-los-ì* ‘I will go’ (p. 121)
1sg-go-ASP

b. *k-à-ram-ì* ‘I will beat you’ (p. 122)
INV-1sg-beat-ASP

However, if the subject is 3rd person and the object a participant, agreement is with the object:

(11) *k-à-mɪn-à* ‘he loves me’ (p. 123)
D-1sg-love-ASP

This can be captured in the following way: A blocking constraint, BLOCK PER, blocks forms with more than one single agreement morpheme (apart from the portmanteau). PARSE PER$^{[-3]}$, which means that person features of [-3] categories should be parsed, is ranked below BLOCK PER but above PARSE PER$^{[+Nom]}$ $\gg$ PARSE PER$^{[+Acc]}$, ranked in this order. We have to distinguish now three cases, which are depicted here schematically in the following tableaus. If one argument is [+3] and the other [-3], only the [-3] argument is realized. Spell-out of both heads would violate blocking and suppression of the [-3] head PARSE $\mathrm{PER}^{[-3]}$:

(12) Mixed:$[+\mathrm{Nom}\ +3]_1[+\mathrm{Acc}\ +1]_2$

	BLOCK PER	PARSE $\mathrm{PER}^{[-3]}$	PARSE $\mathrm{PER}^{[+\mathrm{Nom}]}$	PARSE $\mathrm{PER}^{[+\mathrm{Acc}]}$
☞ $[+1]_2$			*	
$[+3]_1$		*!		*
$[+1]_2[+3]_1$	*!			

If both arguments are [-3], each candidate that satisfies BLOCK PER will violate PARSE $\mathrm{PER}^{[-3]}$, which therefore becomes irrelevant in this case. Since PARSE $\mathrm{PER}^{[+\mathrm{Nom}]}$ is ranked above PARSE $\mathrm{PER}^{[+\mathrm{Acc}]}$, the nominative head surfaces (13). The same is true if both agreement heads are [+3]. While subject and object agreement do not differ in morphological expression, the account predicts that the surfacing marker is coindexed with the subject (14):

(13) Only SAP Arguments: $[+\text{Nom } +2]_1[+\text{Acc } +1]_2$

	BLOCK PER	PARSE PER$^{[-3]}$	PARSE PER$^{[+\text{Nom}]}$	PARSE PER$^{[+\text{Acc}]}$
☞ $[+2]_1$		*		*
$[+1]_2$		*	*!	
$[+2]_1[+1]_2$	*!			

(14) No SAP Arguments: $[+\text{Nom } +3]_1[+\text{Acc } +3]_2$

	BLOCK PER	PARSE PER$^{[-3]}$	PARSE PER$^{[+\text{Nom}]}$	PARSE PER$^{[+\text{Acc}]}$
☞ $[+3]_1$				*
$[+3]_1[+3]_2$	*!			
$[+3]_2$			*!	

Note that the parse preferences are formulated for all constraints w.r.t underlying feature structures, i.e. PARSE PER$^{[+\text{Nom}]}$ requires not the realization of the feature +Nom (which would be the effect of PARSE +Nom), but the realization of the person feature of an *underlying* [+Nom]. PARSE [+Nom] would be irrelevant for simple agreement affixes since there is no such affix that parses this feature.

7.2.2 Western Warlpiri

A similar effect as in Turkana can be found in the Western dialect of Warlpiri described in Hale (1973). While the dual feature of subjects and objects is generally marked by means of separate affixes or fused with person features in a single affix, only one dual is marked if both arguments are dual. According to Hale, the dual which ranks lower on the hierarchy 1 > 2 > 3 is replaced by plural:

(15) a. *njumpala-ḷu ka-n-pala-tjana wawiri-patu*
you-ERG pres-2-dual-3pl kangaroo-paucal
nja-nji
see-nonpast
'You two see the several kangaroos' (p. 329)

b. *njumpala-ḷu ka-nku-lu-tjaraŋku ŋatjara nja-nji*
you-erg pres-2pl-dual-1pl us see-nonpast
'You two see us two' (p. 331)

Again, this can be interpreted as the result of PARSE constraints, ranked according to person features, under the pressure of a higher ranked anti-complexity constraint blocking multiple instances of dual affixes. This is shown schematically in (16):

(16) $[+\text{Nom} +2 + \text{du} +\text{pl}]_1[+\text{Acc} +1 +\text{du} +\text{pl}]_2$

	BLOCK du	PARSE du$^{[+1]}$	PARSE du$^{[+2]}$	PARSE pl
☞ $[+2 +\text{pl}]_1[+1 +\text{du} +\text{pl}]_2$			*	
$[+1 +\text{pl}]_2[+2 +\text{du} +\text{pl}]_1$		*!		
$[+1 +\text{du} +\text{pl}]_2[+2 +\text{du} +\text{pl}]_1$	*!			
$[+1 +\text{dl} +\text{pl}]_2$			*!	*

7.2.3 Dumi

We turn to a language where feature-driven PARSE constraints interact in a more complex manner with other constraints. In Dumi (van Driem, 1993:96) transitive verb forms, different agreement categories block each other's realizations. For example, 1st dual exclusive forms are marked by *-ɨ* (17a), 2nd person dual forms by the dual affix *-i* (17b), while 3sg forms are marked by the [-du] affix *-a* (17c):[4]

[4]Past is the unmarked tense category in Dumi.

(17) a. *phɨkh-ɨ*
get:up-[+1-2+du]
'we (two, exc.) got up' (p. 97)

b. *a-phɨkh-i*
MS-get:up-[+du]
'you (two) got up' (p. 97)

c. *phɨkh-a*
get:up-[-du]
'he got up' (p. 97)

In transitive verbs involving these categories, however, only the category is marked overtly that is higher on the hierarchy 1 > 2 > 3:

(18) a. *duːkhuts-ɨ*
see-[+1-2+du]
'we (two,exc.) saw you (two)' (p. 107)

b. *a-duːkhuts-ɨ*
MS-see-[+1-2+du]
'you (two) saw us (two,exc.)' (p. 108)

(19) a. *a-duːkhuts-i* 'you (two) saw him' (p. 107)
MS-see-[+du]

b. *a-duːkhuts-i* 'he saw you (two)' (p. 108)
MS-see-[+du]

The relevant generalization about blocking seems to be that only simple affixes linked to one argument (with the same index) are allowed in single verb forms. However portmanteaus, such as the marked scenario (MS) affix *a-* in (19b), which parses features of subject and object (see section 7.4.2), are not in a visible blocking relation with any other affix. Also multiple single affixes indexed with the same argument are un-problematic if licensed by parsing requirements:

(20) *phɨk-k-a* ‘we (exc.) got up’ (p. 97)
get:up-[+pl]-[-du]

Blocking with these properties is accounted for by a high-ranked COHERENCE constraint. Recall the definition of COHERENCE from (50) in chapter 3, repeated here as (21):

(21) **COHERENCE** . . . **:** In an output with more than one simple VI meeting the constraint description, count a constraint violation for each such VI (immediately) preceded by another one with a different index set.

Since the expression of two agreement heads (by simple) affixes always involves a violation of COHERENCE, the constraint favors forms agreeing with only one argument. The PARSE preference can now be derived from something like:

(22) PARSE [+1] $\gg$ PARSE [+2] $\gg$ PARSE [+3]

However, (22) is not exactly what we need. For example in (19-a), repeated here as (23), the feature +2 does not surface. Nonetheless, the [+2] argument is expressed by a number affix, while the [+3] object is not:

(23) *a-du:khuts-i* 'you (two) saw him' (p. 107)
MS-see-[+du]

Since all simple affixes under discussion here reflect number distinctions, I will assume that they also realize number. (22) is therefore replaced by:

(24) PARSE $\text{NUM}^{[+1]} \gg$ PARSE $\text{NUM}^{[+2]} \gg$ PARSE $\text{NUM}^{[+3]}$

Because [+1] arguments always surface, the facts derive from the ranking in (24) and COHERENCE([+AGR]) ranked immediately above or below PARSE $\text{NUM}^{[+1]}$. For reasons that will become clear immediately, I will assume that PARSE $\text{NUM}^{[+1]}$ out-ranks COHERENCE. (25) illustrates the ranking for (18):

(25) [+1 -2 +du]$_1$ [+2 -1 +du]$_2$

	PARSE NUM$^{[+1]}$	COHERENCE	PARSE NUM$^{[+2]}$	PARSE NUM$^{[+3]}$
☞ [+1 -2 +du]$_1$			*	
[+du]$_2$	*!			
[+1 -2 +du]$_1$ [+du]$_2$		*!		

There is only one systematic exception to blocking under COHERENCE: In forms with a 1sg and a non-first plural arguments (regardless of which is subject or object), both categories are parsed, even if this is achieved by simple affixes linked to different categories:[5]

(26) a. *doːkhot-t-ə-nɨ*
see-NPast-[+1-pl]-[-1+pl]
'I see them' (p. 107)

b. *a-duːkhus-t-ə-nɨ*
D-see-NPast-[+1-pl]-[-1+pl]
'They see me' (p. 107)

[5] In 1sg → 2nonsg forms occurrence of a 1sg affix is blocked by the portmanteau -*N*.

I suppose that this exception is the effect of a constraint PARSE NUM$^{[-1\ +pl]}$ ranked higher than COHERENCE. This case also motivates the ranking of PARSE NUM$^{[+1]}$ over COHERENCE since otherwise in (26) only the features of the object would be parsed. The ranking necessary for (26) is illustrated in (27):

(27) $[+1\ \text{-pl}]_1\ [+3\ \text{-1}\ +\text{pl}]_2$

	PARSE NUM$^{[-1\ +pl]}$	PARSE NUM$^{[+1]}$	COHERENCE	PARSE NUM$^{[+2]}$	PARSE NUM$^{[+3]}$
$[+1\ \text{-pl}]_1$	*!				
$[-1\ +\text{pl}]_2$		*!			
☞ $[+1\ \text{-pl}]_1\ [-1\ +\text{pl}]_2$			*		

Apart from the 1sg → [-1 -sg] forms, there is only one exception to the hierarchy in (24): In 2sg → 3 forms only the object features are parsed:

(28) *aluph-ini* 'you (sg.) catched them' (p. 109)
catch-[-1+pl]

This is effected by the constraint PARSE NUM$^{[+3 \text{ Acc}]}$ / [+2 +sg], ranked over the constraints from (24), but below all other constraints (2sg is normally marked by the [-du] marker -*a*):

(29) [+2 +sg]$_1$ [+3 +pl]$_2$

	PARSE NUM$^{[-1 +pl]}$	PARSE NUM$^{[+1]}$	COHERENCE	PARSE NUM$^{[+3 \text{ Acc}]}$ / [+2 +sg]	PARSE NUM$^{[+2]}$	PARSE NUM$^{[+3]}$
[-du]$_1$				*!		
☞ [-1 -du +pl]$_2$						
[-du]$_1$ [-1 -du +pl]$_2$			*!			

Finally, we have to account for the 3 → 3 forms. Blocking here is resolved according to a number hierarchy:

(30) a. *doːkhot-t-a*
see-NPast-[-du]
'he sees him' (p. 107)

b. *doːkhos-t-i*
see-NPast-[+du]
'they (du.) see him/he sees them (du.)' (p. 107)

c. *doːkhot-t-ini*
see-NPast-[-1+pl]
'they (pl.) see him/them (du.)' or:
'he/they(du.) see(s) them (pl.)' (p. 107)

Again, hierarchical parsing offers a simple account:

(31) PARSE $\text{NUM}^{[+\text{pl}]} \gg$ PARSE $\text{NUM}^{[+\text{du}]} \gg$ PARSE $\text{NUM}^{[+\text{sg}]}$

This means that, if there is a plural argument, this will be parsed; otherwise, if there is a dual category, this is chosen. Only for cases with exclusively 3sg arguments, a sg argument is marked. These constraints have to be ordered below the constraints of (30) to ensure that e.g. in forms with 2du and 3pl the 2nd person category is preferred over the plural one. The final ranking is illustrated in (32):

(32) $[+3\ +\text{du}]_1\ [+3\ +\text{pl}]_2$

	PARSE NUM$^{[-1\ +pl]}$	PARSE NUM$^{[+1]}$	COHERENCE	PARSE NUM$^{[+3\ Acc]}$ / [+2 +sg]	PARSE NUM$^{[+2]}$	PARSE NUM$^{[+3]}$	PARSE NUM$^{[+pl]}$	PARSE NUM$^{[+du]}$	PARSE NUM$^{[+sg]}$
$[+\text{du}]_1$							*!		
☞ $[-1\ -\text{du}\ +\text{pl}]_2$								*	
$[+\text{du}]_1\ [-1\ -\text{du}\ +\text{pl}]_2$			*!						

7.2.4 Menominee

Menominee shows person-driven competition for three different types of affixes. Reviewing all of these, it becomes clear that feature driven competition cannot be reduced to a single hierarchy of the form $1 > 2 > 3$. Instead, I claim that there are different types of parsing constraints relevant for different affix types.

Person Prefixes

The first type are the pronominal prefixes that appear in the independent order: *ne*, [+1], and *ke*, [+2]. If the verb has a a [+2] argument, *ke* appears.

(33) a. ***ke-****po·se-m* 'thou embarkest' (p. 150)
2-embark-[-3]

b. ***ke-****na·n-ek-w (kena·nek)* 'he fetches thee' (p. 154)
2-fetch-D-[+3]

c. ***ke-****na·n-a·-w* 'thou fetchest him' (p. 152)
2-fetch-D-[+3]

In a parallel fashion, *ne-* appears if one of the arguments is [+1]:

(34) a. ***ne-****po·se-m* 'I embark' (p. 150)
1-embark-[-3]

b. ***ne-****na·n-ek-w (nena·nek)* 'he fetches me' (p. 154)
1-fetch-D-[+3]

c. ***ne-****na·n-a·-w* 'I fetch him' (p. 152)
1-fetch-D-[+3]

Now, there are two situations where both items would be licensed: In forms with an inclusive [+1 +2] plural (35a) and in transitive forms where one argument is 2nd and the other 1st person (35b,c). In both cases, ***ke-*** appears:

(35) a. ***ke-***$po{\cdot}se$-q 'we (inc.) embark' (p. 150)
2-embark-1pl

b. ***ke-***$na{\cdot}tom$-$enen\epsilon$-m-uaw 'I call you (pl.) ' (p. 157)
2-call-D-[-3]-2pl

c. ***ke-***$n\epsilon{\cdot}w$-e-m 'you (sg.) see me ' (p. 156)
2-call-D-[-3]

(36) gives a complete overview of the prefixes; "*" marks the combinations, where no form exists:

(36) Prefix Competition

		Subject			
		1	2	12	3
	1	*	*ke-*	*	*ne-*
	2	*ke-*	*	*	*ke-*
Object	12	*	*	*	*ke-*
	3	*ne-*	*ke-*	*ke-*	*(o-)*
	none	*ne-*	*ke-*	*ke-*	*(o-)*

In intransitive forms with 3rd person subject and forms with two 3rd person arguments in unnegated forms, no prefix appears. However, in the corresponding negated forms, we find *o-*:

(37) a. ***o-****po·se-n-an*
3-embark-PER-NEG
'he does not embark' (p. 150)

b. ***o-****na·tom-eko-n-an*
3-call-D-PER-NEG
'the other does not call him' (p. 170)

My proposal is to analyze the person prefixes as markers of the independent order which bear additional agreement features, as in (38). This accounts straightforwardly for two facts 1) they appear only in the independent order, 2) they are the only inflectional prefixes even preceding portmanteau markers. This follows naturally from the assumption that the prefixes express a non-agreement category and are themselves portmanteaus.

(38) /*ke*/ $\leftrightarrow$ [+ind][+2]
/*ne*/ $\leftrightarrow$ [+ind][+1]
/*o*/ $\leftrightarrow$ [+ind][+3]/ [+neg]

"[+ind]" is the distinctive feature for the independent order. Blocking in all cases is achieved by BLOCK [+ind], which is ranked w.r.t the relevant PARSE constraints as follows:

(39) BLOCK [+ind] $\gg$
PARSE [+2] $\gg$ PARSE [+1] $\gg$ PARSE [+3]

Note that the PARSE hierarchy in (39) refers to the realized features themselves not to the underlying feature content as do the constraints in in (24). Replacing PARSE +2 by PARSE PER$^{[+2]}$ would not predict the appearance of *ke-* instead of *ne-* for an intransitive inclusive plural ((35) a.) form since both affixes parse person features of an underlying [+1 +2] head. This contrasts with what we found for Turkana and Dumi, where PARSE hierarchies had to refer to underlying features. Indeed, such reference is also necessary for certain affixes in Menominee (see 7.3.3); hence I conclude that both types of PARSE constraints are necessary to account for feature asymmetries in direction marking languages.

Person Suffixes

The second class of mutually exclusive affixes are the person markers following the direction affixes which will be discussed in section 7.3.3. In the independent order, *-w* [+3] appears if any non-participant is in the predication, otherwise we get *-m* [-3]:

(40)	a.	*ne-na·n-ek***-w** *(nena·nek)* 1-fetch-D-[+3]	'he fetches me' (p. 154)
	b.	*ne-na·n-a·***-w** 1-fetch-D-[+3]	'I fetch him' (p. 152)

(41) *ke-na·tom-nenϵ-**m**-uaw* 'I call you (pl.) (p. 157)
2-call-[-3]-2pl

In special contexts, instead of -*w* and -*m*, -*n* appears. This comprises independent forms with arguments of an informally speaking low saliency, e.g. with non-specified subjects (42a) and inanimate objects (42b) but also all negated forms, even if -*w* and -*m* appear in the corresponding positive forms (42c):

(42) a. *po·se-**n*** 'there is embarking' (p. 148)
embark-PER

b. *ne-po·n-a·-**n*** 'I put it in the pot' (p. 159)
1-pot:put-D-PER

c. *ne-nϵ·w-a·-**n**-an* 'I do not see him' (p. 169)
1-see-D-PER-NEG

I will assume that what unites these affixes is that they explicitly specify the person feature, i.e. +per and in the case of -*w* and -*m* [+/-3]:

(43) /-*w*/ $\leftrightarrow$ [+per +3]
/-*m*/ $\leftrightarrow$ [+per -3]
/-*n*/ $\leftrightarrow$ [+per]

Impoverishment constraints not to be discussed in detail here block parsing of [+per α3] in contexts such as negation. Otherwise, the distribution of the markers falls out in the usual way: High-ranked blocking of multiple single +per affixes allows only one such affix, and PARSE [+3] is ranked higher than PARSE [-3]. Note that this order of parsing runs counter to the standard feature hierarchy, a possibility which is expected under a theory of rankable constraints.

In the conjunct order, another set of person markers is used, where *-k* corresponds to *-w*, *-yan* to *-m* and *-t* to *-n*. Strikingly, again, only one of these markers appears eeven if two would be licensed, and, again, this is the marker for [+per +3], which shows that the proposed constraints are independent of the concrete affixes obeying them.[6]

(44) a. *na·n-a-**k*** 'when I fetch him' (p. 184)
fetch-D-[+3]

b. *na·tom-en-**k*** 'when he calls you (sg.)' (p. 183)
call-D-[+3]

In both orders the following ranking accounts for the crucial contrasts:

(45) BLOCK [+per] $\gg$ PARSE [+per +3] $\gg$ PARSE [+per -3]

[6] *-yan* is however replaced before the plural affix *-k* by *-yɛ* if it marks a 2nd person argument, cf. *po·se-**yan***, 'you (sg.) embark'; *po·se-**y**ɛk*, 'you (pl.) embark'.

Number Suffixes

A third type of blocking holds between the plural affixes *-enaw* and *-waw*:

(46) a. *ne-po·se-m-**enaw*** 'we (exc.) embark' (p. 150)
1-embark-[-3]-1pl

b. *ke-pu·se-m-**waw*** 'ye embark' (p. 150)
2-embark-[-3]-2pl

In contexts where both would be expected together, only *-enaw* surfaces (47a); however, the 3pl affix *-ak* occurs freely together with *-enaw* (47b) and *-waw* (47c):

(47) a. *ke-na·tom-enenє-m-**enaw***
2-call-D-[-3]-1pl
'we call you (pl.)' (p. 157)

b. *ne-na·n-ek-w-**enaw-ak** (nena·nekonawak)*
1-fetch-D-[+3]-1pl-3pl
'They fetch us (exc.)' (p. 154)

c. *ke-na·n-ek-w-**waw-ak** (kena·nekowawak)*
2-fetch-D-[+3]-[-1+pl]-3pl
'They fetch you (exc.)' (p. 154)

To get an idea of the content of these markers, consider their distribution in different contexts:[7]

(48) Distribution of Menominee plural markers

<table>
<tr><th></th><th>Independent</th><th>Negated Independent</th><th>Conjunct</th></tr>
<tr><td>1</td><td colspan="2">-enaw</td><td rowspan="2">-k</td></tr>
<tr><td>2</td><td colspan="2">-waw</td></tr>
<tr><td>3</td><td>-ak</td><td colspan="2">-waw</td></tr>
</table>

-enaw occurs only in [+1] forms, *-waw* only in [-1] forms. Thus, the VIs for the plural markers look like the entries in (50). Blocking can then be expressed by the constraint in (49):

(49) BLOCK [α1 +pl]

(50) /*enaw*/ $\leftrightarrow$ [+1 +pl]

/*waw*/ $\leftrightarrow$ [-1 +pl]

/*ak*/ $\leftrightarrow$ [+3 +pl] / [+ind][+pos]

/*k*/ $\leftrightarrow$ [-3 +pl]/ [+conj]

[7]Note that the plural marker *-k* is distinct from the homophonous third person marker which appears in the examples in (44). In contrast to the latter, plural *-k* appears after person markers, as in (51).

Since [-3] arguments are generally not expressed by -*waw* and -*enaw*, as in (51), there has to be an additional impoverishment constraint (52):

(51) *po·se-yan-k* ‘we (inc., exc.) embark’ (conj., p. 176)
embark-[-3]-pl

(52) IMPOVERISH [α1 +pl] [-3] / [+conj]

Since blocking regards VIs, not the underlying heads, this predicts that -*waw* should also be blocked by -*enaw* where -*waw* would express a 3pl argument, as is the case in negated forms:

(53) *ne-nє·wa·-n-**i·naw**-an*
1-see-D-PER-1pl-NEG
‘We do not see them’ (p. 169)

On the other hand, there should be no blocking of -*waw* expressing 3pl with the marking of 1/2pl in the conjunct which is achieved there by the [-3 pl] marker -*k* which is not subject to BLOCK [α1 +pl]. This prediction is also correct:

(54) *na·tum-en-yan**-k-waw***
call-D-[+3]-[-3+pl]-[-1+pl]
‘when they call us (inc.)’ (conj., p. 183)

Of course, also the combinations of two occurrences of -*waw* in 3pl → 3pl forms is correctly excluded. (55) summarizes the cases where blocking occurs (boldface); "*" marks the cases where the combination of two affixes is excluded for independent reasons:

(55) Combinations of Plural Markers

	-*enaw*	-*ak*	-*waw*	-*k*
-*enaw*	*	-*enaw-ak*	***-enaw***	*
-*ak*	-*enaw-ak*	-*ak*	-*waw-ak*	*
-*waw*	***-enaw***	-*waw-ak*	***-waw***	-*k-waw*
-*k*	*	*	-*k-waw*	-*k*

What is hitherto unexplained is the blocking of two -*k*'s or two -*ak*'s. Note that – due to their context restrictions – both markers never compete for realization in one and the same form. Nonetheless, their reflexive blocking can again be captured straightforwardly by:

(56) BLOCK [α3 +pl]

The complete ranking – including the relevant PARSE constraints – looks like:

(57) IMPOVERISH $[-3]^{[\alpha 1\ +\text{pl}]}$ / [+conj] $\gg$
BLOCK [α3 +pl], BLOCK [α1 +pl] $\gg$
PARSE [+1 +pl] $\gg$ PARSE [-1 +pl]

3pl and obviative

Indeed, -*ak* is also blocked by the [+obv] affix -*an* which shares with it its position. Note that [+obv] arguments never show any number distinction. Only the plural marker -*ak* surfaces if both categories are present in different arguments (58c):

(58) a. *po·se-w**-an***
embark-[+3]-OBV
'the other embarks' (p. 150)

b. *po·se-w**-ak***
embark-[+3]-3pl
'they embark' (p. 150)

c. *na·n-ϵ·-w**-ak*** ***(*-an)***
fetch-D-[+3]-3pl
'they fetch the other' (p. 152)

This position class is somewhat unexpected under my approach since there seems to be no reason to connect the features [+/-obv] and [+/-pl]. Steele (1995) argues for Potawatomi that [+/-obv] is a third number feature which would thus explain that obv-affixes share the position of plural markers and are not marked themselves plural (since num can have only one value: pl or obv.) There are, however, Menominee data that speak against this account; namely in the conjunct the obv-affix appears not in final position, but even before person marking (59a) which precedes on its side all number marking (59b):

(59) a. *po·se-**ne**-t*
embark-OBV-[-3]
'when the other embarks' (p. 177)

b. *pu·se-t-**waw***
embark-[-3]-[-1+pl]
'they embark' (p. 177)

I will therefore assume that the mutual exclusiveness of plural and obviation affixes corresponding to different arguments derives not from blocking but from an independently motivated impoverishment constraint. Indeed, obviative marking is excluded in most transitive forms even if the other argument is sg[8]:

(60) *na·n-ϵ·-w* ***(*-an)***
fetch-D-[-3]
'he fetches the other' (p. 152)

[8]Obv *is* marked if the other argument is inanimate as in *nϵ·kn-ek-w-**an***, it kills the other' (p. 154).

The explicit marking of plural for a [+obv] head is blocked by the impoverishment constraint IMPOVERISH $[+\text{pl}]^{[+\text{obv}]}$. To explain that -*ne* and -*an* have different positions, it suffices now to give them the entries in (61) and to assume the ranking of alignment constraints in (62):

(61) /*an*/ $\leftrightarrow$ [+3 +obv +num]
/*ne*/ $\leftrightarrow$ [+3 +obv]

(62) [+num] ➪ R $\gg$ L ⇦ [+obv]

Blocking, Position Classes and Feature Hierarchies

The elements blocking each other in Menominee typically also have the same position w.r.t other markers. For example, the plural affixes marked for [+/-1] all appear after the person markers and before the obv and 3pl affix. This is – in principle – expected in a framework where the inherent features of affixes for the most part determine their position and their blocking properties. That the order of Menominee affixes in my analysis follows from universal principles of affix order (see 6.2 and 6.3), given the assumed lexical entries, thus gives independent support for the blocking analysis. While we thus expect large by large correspondence of position classes and blocking, there should be place for some divergence since, after all, both phenomena (affix order and blocking) are determined by different constraints. In fact, we will see that the direction markers – forming a further blocking category in Algonquian – behave uniformly w.r.t. position in Menominee but show different positions w.r.t negation affixes in the closely related language Potawatomi.

Another interesting point about Menominee is the role of feature hierarchies in affix realization. For different affix classes, different person features are preferred by PARSE constraints, as illustrated in (63). "✌" indicates that the person feature in the respective row prevails for the affix class specified in the head of the column. "(✌)" stands for the preference of 1st person prefixes which is restricted to competing 3rd person prefixes.

(63) Person-driven Competition in different affix classes

	Person Prefixes	**Person Suffixes**	**Number Suffixes**
	$+2 \gg +1 \gg +3$	$+3 \gg -3$	$+1 \gg -1$
1	(✌)		✌
2	✌		
3		✌	

Of course, this ranking makes sense functionally if we give up the idea that a language has a fixed person hierarchy responsible for affix selection (see e.g. Noyer (1992)). Since for each affix type different features are preferred, this will lead in the general case to the maximization of feature exponence.

Different ranking of these constraints is also attested between languages. Anderson (1992:130) cites two dialects of Cree where the plural markers -*a:n* and -*a:wa:w* compete in a way analogous to Menominee -*enaw* and -*waw*. But while in the first dialect -*a:n* "wins" over -*a:wa:w*, in the other the preference is reversed:

(64) Number Affixes in Different Dialects of Cree

	Dialect I	**Dialect II**
1pl	*k(i)-* ... ***-a:n***	
2pl	*k(i)-* ... ***-a:wa:w***	
1pl/2pl	*k(i)* ... ***-a:n***	*k(i)* ... ***-a:wa:w***

Assuming that -*a:n* and -*a:wa:w* also express the contrast [+/-1 pl], this is evidence that the order of the relevant constraints can be reversed while most other factors remain equal. Thus, in both dialects of Cree as in Menominee, [+2] prefixes have preference over those for [+1], and, again, BLOCK [α1 +pl] has to be ranked over the PARSE constraints.

7.2.5 Other Approaches to Hierarchy-Based Competition

Anderson (1992)

Anderson (1992) takes the exclusiveness of affixes in the same position in Potawatomi to reflect arbitrary rule blocks, where the application of a rule blocks that of any lower ranked rule in this block. Thus, for the Potawatomi affixes roughly corresponding to Menominee *-enaw* over *-waw*, (*mun* = [+ 1 +pl], *m* = [2 +pl]), he assumes the following block (ibid:178):

(65) [+1 +pl] /X/ → /X-mun/
[+2 +pl] /X/ → /X-m/

While this works technically, it does not capture the fact that the items blocking each other in each case are of basically the same type, which determines both their blocking and their position w.r.t. each other.

Steele (1995)

In Steele's (1995) analysis of Potawatomi position classes, application of rules is in blocks – motivated by the information the rules of this block add to a word form. This is much in the same spirit as my analysis, but Steele does not give an actual formal device that ensures the formation of rules into such a block.[9] Moreover, the way this is formulated seems to imply that affixes blocking each other are always in the same rule block which is – as we saw – not true for the ordering of Potawatomi direction markers.[10]

More critical is the device Steele uses to account for the priority of certain affixes over others, such as *-mun* over *-m* in (65), since she rejects arbitrary rule ordering inside of single blocks. What she does is to associate the "suppressed" information with the rule introducing the "winning" affix which leads to extremely complex rules[11]. Thus, (65) looks like (66):

---

[9]What she gives is a kind of phrase structure grammar which assigns labels such as "stem", "extended stem" and "transitive stem" and "word" corresponding to units as "stem +theme", "stem+theme+plural-marker" etc. But these seem rather arbitrary labels to identify the single rule blocks, which are otherwise stipulated by the grammar writer.

[10]Steele comments the problem in her discussion of Halle and Marantz (1993) as follows: "In short the two analyses [hers and that of Halle and Marantz (1993), JT] do not agree on the essential divisions in Potawatomi words. (p. 307)."

[11]An alternative means in her system is to take a phonologically vacuous rule that introduces the missing information. But this would also have to be put in a different rule block to be not blocked by the overt affix, which undermines again the claim that operations of the same type are in the same block. Moreover, it would not explain why the empty alternative is not available in cases where no blocking obtains.

(66)

a. $$X \quad [+Nom]\left(\begin{bmatrix} +Acc \\ +an \end{bmatrix}\right) \rightarrow Xm \quad \begin{array}{ll} [+Nom] & \left(\begin{bmatrix} +Acc \\ +an \end{bmatrix}\right) \\ \mathbf{-1} & (+\mathbf{sg}) \\ +\mathbf{pl} & \end{array}$$

Domain Condition: No +3 argument

b. $$X \quad \begin{array}{ll} [+Nom] & ([+Acc]) \\ (vPER) & \emptyset PER \end{array} \rightarrow Xmun \quad \begin{array}{ll} [+Nom] & ([+Acc]) \\ (vPER) & +\mathbf{1} \\ (\mathbf{varNum}) & +\mathbf{pl} \end{array}$$

where v $\neq$ 3

The features outside of "[ ]" are intended by Steele as floating features that can attach either to [+Nom] or [+Acc]. "v" is meant as an indeterminate but specified person value set by an extra condition not to be [+3], while "var" expresses that the rule can introduce sg or pl as number values. The round brackets "(,)" express the fact that *-mun* also applies in intransitive forms. A further stipulation is added by Steele that requires the reduced form, where expressions in round brackets are omitted, only to apply to intransitive forms.

Apart from the complexity of such rules, another problem is that preference for certain affixes in the case of blocking is resolved by the specification of single affix rules, which – at least for Menominee – misses an important point. Recall that there are different person markers in the independent and the conjunct order. But in both cases, the [-3] affix has precedence over the [+3] affix. This would have to be captured by Steele through a [+3][-3] specification for the winning affix, an information which must crucially be doubled for the independent (-*w*) and the conjunct (-*k*) affix.

Wunderlich (1996)

While in Steele's approach there is no principled account for affix preference under blocking, in Wunderlich's (1996) analysis of Potawatomi, blocking itself is the result of lexical stipulation. This is necessary, in a way, since he relies crucially on the single feature hierarchy in (67):

(67) [+2] > [+1] > [+3] > [-an]

But as we saw for Menominee, no single feature hierarchy can determine all cases of affix selection. For the prefixes he assumes, the following entries (ibid:191), where [-ha] stands for "there is no higher animate":

(68) /*ke*-/ [+2] /-ha

/*ne*-/ [+1] /-ha

/*w*-/ [+3] /-ha

This, as well as the analysis proposed in 7.2.4, resorts on a type of hierarchy. The crucial difference is that blocking in Wunderlich's account is effected by repeating three times the same context restriction, while it is captured by a single constraint in DO. The blocking of -*m* by -*mun* is effected by the assumption that "a word form becomes maximal if /mun/ is affixed:

(69) /mun/$]_{+max}$" (ibid:292)

Evidence for this is that in Potawatomi immediately after -*mun* no other agreement markers are allowed. Under the MM-assumption that specific markers are always attached first, the more specific -*mun* ([+1 +pl]) is affixed before -*m* ([+pl]) which therefore has no more chance to attach to a maximal word. This account is flawed by the fact that in Menominee there is an entirely parallel blocking between the corresponding affixes -*enaw* and -*waw* (see (47)), but the "winning" -*enaw* does not have the "word-closing" effect of -*mun* (70a); the same seems to be true for Cree, where the affix 1pl -*naan* blocks -*waaw* and also can be followed by additional agreement marking (70b):

(70) a. *ne-na·n-ek-w**-enaw-ak** (nena·nekonawak)*
1-fetch-D-[+3]-1pl-3pl
'they fetch us (exc.)' (p. 154)

b. *ni*-Stem-*iko**-naan-ak***
1-. . .-D-1pl-3pl
'they . . . us (exc.)' (Fabri, 1996:21)

Blocking of this affix class, thus, seems to be a stable feature of Algonquian, independently of the idiosyncratic impoverishment induced by *-mun*. This conclusion is also enforced by the observation that *-waaw* wins over *-naan* in the second dialect of Cree (see (64)). Blocking thus – contrary to Wunderlich – seems to be due to an explicit constraint not to lexical stipulation. But assuming a blocking constraint in Wunderlich's framework would make it impossible to make a principled choice between the affixes, which cannot follow from specificity because this leads to problems with the second dialect of Cree and neither from his feature hierarchy where [+1] is ranked relatively low. Problematic for specificity is also the class of person affixes, which appears before all number affixes. If the latter contain at least in part person-number specifications, they should be followed by the person markers, counter to fact.

McGinnis (1995)

In McGinnis' treatment of Ojibwa (McGinnis, 1995), person prefixes and medial number affixes are treated as syntactically fusing clitics (subject and object) and agreement heads (subject and object) where the latter copies features from a head agreeing with objects (OF) motivated by the requirement for clitics that they "must be licensed by checking against their agreement features" (p. 173) word-internally. 3pl and obv affixes correspond to features fissioned of from OF and attracted by a rightmost position adjoined to C(OMP) (the complementizer head). Translating this to Menominee we get something like:

(71)

Clitics	Stem	OF	??	AGR	C
[+1 +pl] [+2 +pl]		[+1 +pl]		[+1 +pl] [+2 +pl]	
ke-	*na·tom*	*-enenɛ*	*-m*	*-enaw*	
2-		-D	-[-3]	-[+1 pl]	
'you (pl.) fetch us' (p. 156)					

(72)

Clitics	Stem	OF	??	AGR	C
[+2 +pl] [+3 +pl]		 [+2 +pl]		[+2 +pl]	 [+3 +pl]
ke-	*na·n*	*-eko*	*-w*	*-waw*	*-ak*
2-		-D	-[-3]	-[-1 pl]	
'they fetch you (pl.)' (p. 154)					

Note first that the approach contains a number of ad hoc stipulations to force multiple exponence: the requirement of clitics to be checked against agreement and the claim that traces created by fission are subject to vocabulary insertion[12] as in the fissioning of features from OF to C. Problems with the assumption that the affixes labeled OF (direction markers) correspond to a single syntactic head are discussed in 7.3.4 . The analysis also requires extensive use of rightward movement, not possible in an antisymmetric account of affix order.

An obvious problem of the approach for Menominee is the existence of a third head (corresponding to the person suffixes, marked as "??" in (71) and (72)) agreeing in principle with all arguments. Following the logic of McGinnis' approach, we would have to stipulate a further fused head here, even more difficult to motivate. Even if this could be

[12]Which undermines basically the notion of fission and likens it to a copy operation.

made to work, we would have three different heads all basically with the same content, without any motivation that these express systematically different features. Thus, it would be pure accident that the person suffixes express person features and the next position number affixes and the feature [+/-1]. In other words, we get the problems with discontinuous bleeding typical for approaches without fission-like devices (see 5.2.2).

For the only position where the feature content is justified by the approach (the one labeled C in (72)), the account is problematic for empirical reasons: To see this, recall from (48) that 3pl is expressed in negated and conjunct forms by the [-1 pl] marker -*waw*, and -*enaw* stands in a blocking relation with it:

(73) *ne-nϵ·wa·-n-**i·naw**-an* 'We do not see them' (p. 169)
1-see-D-PER-1pl-NEG

This is evidence that blocking is not due to the underlying head – which is a central claim of McGinnis – but to the vocabulary item itself.

Tightly connected to the analysis of McGinnis is that of Halle and Marantz (1993), which agree with her for the analysis of prefixes. All other agreement positions are treated as independent agreement heads adjoined to Tense (AGR in (72)), C (C), and Ind (the Independent head, OF in (72)). OF and C are not related by fission but by concord. For Menominee, basically the same problems arise: One more agreement node to account for without a principled explanation of affix order. As in McGinnis' approach, the blocking of 3pl -*waw* in (73) is unexpected.[13]

7.3 Direction Marking

Typical analyses of direction markers – often implicitly – assign to these very rich representations. They are argued to encode the fact that in a transitive predication the object is higher or lower w.r.t. an animacy hierarchy than the subject. The assumption here is that the markers themselves have a much more simple content and that their distribution follows from the interaction of general constraints, reflecting factors usually implemented through feature hierarchies.

[13]Halle and Marantz (1993) claim that in the Potawatomi conjunct there is only one agreement head agreeing with both arguments, perhaps with "some splitting of features ... into independent terminal nodes." (p. 147). This is certainly not true for Menominee, where affix structure in the conjunct is by large parallel to that in the independent. I suppose that closer examination of Potawatomi conjunct order would lead to a similar result.

7.3.1 A Minimal Representation for Direction Markers

The typical distribution of direction markers is in transitive verb forms together with person/number affixes that are not specified for case. Consider as an example the Turkana prefix *k-* that appears in (74) together with the agreement marker *à-* which can be used to mark subjects or objects (see 7.2.1):

(74)	*k-à-mɪn-à* INV-1sg-love-ASP	'he loves me' (p. 123)

Thus, it is a natural assumption that direction markers express just the case features left unexpressed by the caseless agreement affixes and are represented by something like:

(75) [+Nom ...][+Acc ...]

Since there will be PARSE constraints requiring the realization of [+Nom] and [+Acc], this explains why direction affixes must appear. The presence of [+Acc] also implies that they only appear in transitive contexts. This also goes well with the fact that direction markers often seem to encode additional information about subjects *and* objects. Thus, in Menominee, the direction marker *-e* typically appears with 2nd person subjects and 1st person objects while -*enene* with 1st person subjects and 2nd person objects:

(76) a. *kenɛ·w-e-m-enaw* 'you (pl.) see us' (p. 156)
2-see-D-[-3]-1pl

b. *kena·tom-enenɛ-m-enaw* 'we call you (pl.)' (p. 157)
2-see-D-[-3]-1pl

As already noted, in addition to inverse markers, there are also direct markers. I will refer to both classes of affixes by the term "direction marker". Interestingly, there seems to be an asymmetry between the two types of direction markers: There are languages with inverse markers and without direct markers but no languages with only direct markers. So, to begin with, we look at languages which are maximally simple in this respect and have only inverse marking.

7.3.2 Systems with Inverse Markers only

Palaeosiberian

In the Palaeosiberian language Koryak (Comrie, 1980:65), an inverse marker (here: *ne*-) occurs in all contexts where the subject is [+3] and the object is [-3] (77a,b), or the subject is 2nd and the object 1st person (77b):

(77) a. ***ne- l'u-gi*** 'he sees you (sg.)' (p. 65)
D-see-O1sg

b. ***ne-l'u-mək*** 'you (pl.)/he see(s) us' (p. 65)
D-see-O1pl

In the converse situations, no such marking obtains:

(78) a. *t-V* ... 'I see you/him'. (p. 65)
1sg-

b. *l'u-tkə* 'you (pl.) see him' (p. 65)
see

Assuming that *ne-* is specified maximally simply, as [+Nom][+Acc], and that its appearance is favored in all transitive forms by PARSE constraints, the natural way to block its appearance in direct contexts is to assume impoverishment constraints as the ones in (79):

(79) a. IMPOVERISH [+Nom][+Acc] / [+Nom -3][+Acc +3]

b. IMPOVERISH [+Nom][+Acc] / [+Nom +1][+Acc +2]

Two objections might be raised against this account: Why first force the appearance of inverse markers to block them later? And: Why not refer directly to the hierarchy 1 > 2 > 3 instead of "cutting it into pieces" like in (79)?

For the first point, recall that the account is intended to extend to languages with *direct* markers which will also be represented as portmanteaus. For these languages, we need to require that portmanteaus are present in virtually all contexts, which will anyway follow in DO everything else equal from something like PARSE [CASE]. Thus, the impoverishment constraints in (79) are not worse in this respect than PARSE constraints for direct configurations. But assuming only PARSE constraints, we have no explanation why direction marking is ever absent.

Moreover, an account of this type predicts the observation made previously that there are direction-marking languages with only inverse markers but none without. To see this, assume for the moment that (79a) is the only relevant impoverishment constraint, abbreviated in the following as "IMPOVERISH CASE" and look at the two possible rankings for this and PARSE CASE. If IMPOVERISH CASE is ranked higher than PARSE CASE, we get an inverse language (only inverse markers):

(80) Inverse Language/Inverse: [+Nom +3][+Acc -3]

	IMPOVERISH CASE / [-3][+3]	PARSE CASE
☞ I-V		
V		*!

(81) Inverse Language/Direct [+Nom -3][+Acc +3]

	IMPOVERISH CASE / [-3][+3]	PARSE CASE
D-V	*!	
☞ V		*

If the ranking is reversed, a full direction marking language emerges (inverse and direct markers):

(82) Direction Language/Inverse: [+Nom +3][+Acc -3]

	PARSE CASE	IMPOVERISH CASE / [-3][+3]
☞ I-V		
V	*!	

(83) Direction Language/Direct [+Nom -3][+Acc +3]

	PARSE CASE	IMPOVERISH CASE / [-3][+3]
☞ D-V		*
V	*!	

Crucially, no ranking leads to a language with direct marking but without inverse marking. The second objection that could be raised against (79) is that it is unnecessary to split reference to a feature hierarchy into different constraints. This move, however, is justified by the fact that the pieces of the hierarchy relevant for inverse marking differ in different languages, which necessitates factorizing the hierarchy in some way. In fact, we need to split up the constraints even more. Thus, in Koryak, inverse marking also obtains if the subject is 3rd plural and the object 3sg:

(84) ***ne-lˀu-n*** 'they see him' (p. 65)
I-see-O3s

There are very few languages marking this constellation as inverse, even if they pattern with Koryak in other respects. If we want to maintain the idea of a universal hierarchy, we have to factorize it. Intuitively to express that there is a hierarchy like 3g > 3pl, we need the constraint:

(85) IMPOVERISH [+Nom][+Acc] / [+Nom +3 +sg][+Acc +3 pl]

Actually, 3pl subject forms are marked inverse even if the object too is 3pl (86a) while no such marking is found if both are 3rd sg (86b):

(86) a. *ne-lˀu-new* 'they see them'(p. 65)
I-see-O3p

b. *lˀu-nin* 'he sees him' (p. 65)
see-O3

Given a hierarchy like [-3] > [+3 +sg] > [+3 +pl], we cannot predict whether symmetric forms are marked as inverse or not, which suggests that there are also impoverishment constraints for such situations, such as:

(87) IMPOVERISH [+Nom][+Acc] / [+Nom +3 +sg][+Acc +3 sg]

Accounting for languages that do not mark this constellation as inverse, while patterning otherwise with Koryak, can be achieved straightforwardly by ranking (87) below PARSE CASE and the other impoverishment constraints. In Koryak, of course, all impoverishment constraints introduced are ranked over PARSE. Also the third possible ranking seems to be attested resulting in inverse marking where only inverse configurations with 3pl subjects should be marked, which is the case in Kamchadal, another Palaeosiberian language cited by Comrie (1980:65).

Another complication in Koryak is the existence of a second inverse marker, *inə-*, that appears if the object is 1sg and the subject has any value different from 3pl. Differentiation is even greater in the related language Chukchi,which has inverse marking in exactly the same contexts as Koryak but as many as four different inverse markers (Krause, 1976:188). This is shown in (88). This means that all affixes – apart from *ne-* – must be further specified for their object and subject features as in (89). Assuming that only one direction affix is licensed by blocking constraints, there is competition for insertion between *ni-* and *ne-* and *ine-* and *-tku* for certain feature combinations. Under any circumstances, *ni-* will win over *ne-* when it is licensed by the input since it parses all and more features than *ne-*. The specific parsing constraints of Chukchi will account for the cases where *ne-* competes with *ine-*, but I will not go into details here because the data are highly complex and empirically far from clear.[14]

[14]It is possible that *ine-* is not an inverse marker of the type to be discussed here since it seems not to be obligatory. While Skorik (1961, 1977) – which is also the main source of Krause (1976) – claims it to be so, it is often absent where he would predict it in the data he gives (J.D. Bobaljik, p.c.). This morpheme also appears in more functions that seem synchronically dissociated (Krause, 1976:187 ff.).

(88) Direction Markers in Chukchi

		Subject					
		1sg	1pl	2sg	2pl	3sg	3pl
Object	1sg	X	X	*ine-*	*ine-*	*ine-*	*ne-*
	1pl	X	X	*-tku*	*-tku*	*ne-*	*ne-*
	2sg	-	-	X	X	*ne-*	*ne-*
	2pl	-	-	X	X	*ne-*	*ne-*
	3sg	-	-	-	-	*ni-*	*ne-*
	3pl	-	-	-	-	*ni-*	*ne-*

(89) */-tku/* ↔ [+Nom +2][+Acc +1 +pl]
/ni-/ ↔ [+Nom +3 -pl][+Acc +3]
/ine-/ ↔ [+Nom][+Acc +1 +sg]
/ne-/ ↔ [+Nom][+Acc]

I will give one further detail, however, to show that the analysis fits well with the DO assumptions about feature parsing: First person plural objects are generally marked by -*mək* as in 3sg:1pl *ne-Stem-mək*, 2pl arguments by -*tək* as in 2p:1s *ine-Stem-tək*. For the combination 2P:1P, in addition to the portmanteau -*tku*, -*tək* is inserted, not -*mək*. This fact is accounted for straightforwardly since all features present in -*mək* are already parsed by -*tku* while -*tək* additionally parses the plural feature of the 2nd per subject. For Koryak, Comrie notes that forms with *ine-* act as intransitive. This is naturally accounted for: If *ine-* is specified as [+Nom][+Acc +1 +sg] and parses all relevant object features, no further object affix is necessary.

Turkana

In Turkana (Dimmendaal, 1983), person agreement in transitive predications is typically with only one argument (for details see section 7.2.1):

(90)	a.	*à-mɪn-à* 1sg-love-ASP	'I love her' (p. 69)
	b.	*ɛ̀-ràm-e-tè* 3-beat-ASP-Spl	'they will beat them' (p. 123)

If there is a non-third person object, additionally the inverse marker *k-* is inserted:

(91)	a.	*k-à-ram-ì* INV-1sg-beat-ASP	'I will beat you' (p. 122)
	b.	*k-ì-ràm-e-tè* INV-1sg-beat-ASP-SPl	'you beat me' (p. 122)
	c.	*k-à-mɪn-à* INV-1sg-love-ASP	'he loves me' (p. 123)

The obvious problem for a naive feature hierarchy approach is that – assuming the hierarchy 1 > 2 > 3 – there should be no inverse marking in (91a). Also assuming a feature hierarchy for Turkana like 2 > 1 > 3 is of no help, since this would mean that *k-* should be absent in (91b). To solve this, recall that we had another case where a symmetric constellation counted as inverse, 3pl → 3pl in Koryak and Kamchadal. Hence, I will assume that, in addition to the impoverishment constraints in direct predicates, there are similar constraints for symmetric predicationa such as in (92):

(92) a. IMPOVERISH [+Nom][+Acc] / [+Nom +3][+Acc +3]
b. IMPOVERISH [+Nom][+Acc] / [+Nom -3][+Acc -3]

(92b) will be crucially undominated in Turkana while the corresponding constraint for [+Nom +1][+Acc +2] is dominated by PARSE CASE. Again, other agreement affixes are underspecified for case[15], which makes insertion of *k-* obligatory by most conceivable rankings of PARSE CASE. Wile *k-* is intuitively what we want to call an inverse morpheme, it cannot be characterized by a strict hierarchy. Assuming a hierarchy here, it should be of the form 1 > 2 > ... to account for (91b). But

[15] The only exception is the plural suffix (cf. (91c)), which is restricted to subject agreement and hence presumably parses +Nom. Since *k-* marks (at least) +Acc, again, both affixes are justified by PARSE CASE.

this would let us expect no marking for (91a). Thus, the assumption that the distribution of *k-* is governed by such a hierarchy leads to a contradiction, while the parsing account again gives a straightforward solution.

Nocte

The Tibeto-Burman language Nocte (Gupta, 1971; DeLancey, 1985) seems to differ from Turkana only in the differentiation of its inverse markers: The marker *-h* appears in transitive verb forms if the subject is 3rd person and the object is 1st or second person, or if the subject is 2nd person and the object is 1st person. This distribution is illustrated in (93) (Gupta, 1971:21):

(93) a. *hetho-**h**-ang* 'you/he will teach me'
teach-I-1

b. *hetho-**h**-o* 'he will teach you'
teach-2

If the person values of subject and object are reversed, no *-h* appears:

(94) a. *hetho-min* 'I will teach you (pl.)'
teach-1pl

b. *hetho-ang* 'I will teach him'
teach-1

c. *hetho-o* 'you will teach them'
teach-2

Note, however, that *-o* and *-ang* are also used with intransitive verbs to mark 1st and 2nd person agreement while *-min* is not. It is plausible, therefore, to view *-min* as a portmanteau like [+Nom +1][+Acc +2] which takes precedence over *-h* and also blocks the non-portmanteau agreement affixes.[16].

As with Koryak and Chukchi, two languages (Nocte and Turkana) agree in the basic distribution of inverse marking and differ only in the differentiation of inverse markers.

7.3.3 A Full Direction-Marking System: Menominee

Systems which mark direct constellations on a par with inverse ones are rather rare. Indeed in its "pure" form this seems to be instantiated by Algonquian only. As an example, I will discuss in detail direction marking in Menominee. There are however systems which show markers very close to archetypic direction markers, which will be discussed

[16]There is also the possibility to mark $1 \rightarrow 2$ constellations with the 1st plural affix *-e*. If we assume that plural is represented not by a single feature, but by two fused [+Agr] FSs, *-e* could be formalized as [+1 +Nom][-3], which would be met by 1pl and $1 \rightarrow 2$. A similar type of portmanteau is discussed for Dumi in 7.4.2.

in 7.4 and are shown to fit neatly in the proposed account, but to be problematic for other approaches to direction marking.

Menominee, apart from the presence of direct markers, represents a rather complex system of direction marking for three reasons:

- There are five different direction markers.
- The distribution of these markers differs according to the morphological context (negation affixes and order).
- Direction marking reflects a big number of contrasts/features. In traditional terms: It refers to a very elaborated feature hierarchy.

I will start the discussion by laying out the last problem and the approach I am proposing to handle it. The rest of the section will give a detailed analysis of the distribution of all markers showing how the proposal extends to the first two points.

Inverse vs. Direct Markers

Recall from 7.1 that -*a·* is used when the subject is 1st/2nd person and the object is third person, while -*eko* is used in the converse constellation:

(95) a. *ne-na·n-**a·**-w-enaw-ak*
1-fetch-D-[+3]-[+1+pl]-[-1+pl]
'we (exc.) fetch them' (p. 153)

b. *ne-na·n-**ek**-w-enaw-ak* *(nena·nekonawak)*
1-fetch-D-[+3]-[+1+pl]-[-1+pl]
'they fetch us (exc.)' (p. 154)

This suggests an account by means of the following simple representations:

(96) *a·* $\leftrightarrow$ [+Nom -3] [+Acc +3]
eko $\leftrightarrow$ [+Nom +3] [+Acc -3]

However, this does not work for all cases. Both affixes appear in certain contexts where all arguments are [+3]. For example, if the subject is proximate and the object obviative, -*a·* appears (here in its variant -*ϵ·*), in the converse situation we get -*eko*:

(97) a. *na·n-ϵ·-w*
fetch-DIR-[+3]
'he fetches the other' (p. 152)

b. *na·n-ek-w* *(na·nek)*
fetch-INV-[+3]
'the other fetches him' (p. 154)

(98) shows a summary of the constellations where the markers appear. Both markers appear in combinations with "indefinite actor", which is presumably [+3], and in combinations of inanimates with other 3rd person arguments. Apart from the indefinite actor case, which has no corresponding patient category, *-a·* presents the mirror image of *-eko*. Note that *-a·* and *-eko* are replaced in certain contexts by other direction markers. This will be discussed in the following sections.

(98) Distribution of *-a·* vs. *-eko*

-a·			*-eko*		
1/2	→	3	3	→	1/2
indef. actor	→	3	indef. actor	→	1/2
proximate	→	obviative	obviative	→	proximate
3 (animate)	→	3 (inanimate)	3 (inanimate)	→	3 (animate)
obviative	→	3 (inanimate)	3 (inanimate)	→	3 (obviative)

This complex distribution makes it look rather hopeless to account for the distribution of *-a·* vs. *-eko* by simple feature specification in the VIs. However, when we decompose the single categories of (98) by their feature specifications (see (9)), an interesting generalization emerges:

(99) Distribution of *-a·* vs. *-eko*

-a·			*-eko*		
[1/2 **+an**]	→	[3]	[3]	→	[1/2 **+an**]
[3 -def **+an**]	→	[3 +def]	[3 -def +an]	→	[1/+2 **+an**]
[3 -obv **+an**]	→	[3 +obv +an]	[3 +obv +an]	→	[3 +obv **+an**]
[3 -obv **+an**]	→	[3 -an]	[3 -an]	→	[3 -obv **+an**]
[3 +obv **+an**]	→	[3 -an]	[3 -an]	→	[3 +obv **+an**]

Whenever *-a·* is used the subject is [+an]; if *-eko* appears, the object is [+an]. Since this feature is not realized by any other agreement affix in Menominee, it is plausible that it is part of the specification of the direction markers as in (100):

(100) *a·* ↔ [+Nom +an] [+Acc]
eko ↔ [+Nom] [+Acc +an]

At the first glance, this looks hardly better than the specifications in (96), since for many cases both markers would be licensed. For example, if one argument is 1st person and the other proximate/animate: Since both arguments are animate, both markers should be possible:

(101) a. [+Nom +1 +an] [+Acc +3 -obv +an]
b. [+Nom +3 -obv +an] [+Acc +1 +an]

But recall that [+an] is only realized by the direction markers. Hence, each PARSE constraint referring to this feature will potentially have an effect on the distribution of these markers. The basic idea now is that for certain categories the feature [+an] is more typical than for others, which has the effect that it should be realized with priority. For example, non-third-person arguments are typically animate, while this is only true to a much more restricted degree for 3rd person arguments. To translate this observation in terms of DO, we can assume the following ranking of PARSE constraints:

(102) PARSE $[+\text{an}]^{[-3]} \gg$ PARSE $[+\text{an}]^{[+3]}$

This ranking has exactly the effect to favor *-a·* for (101a) and *-eko* for (101b). Note that the case features of the feature structures in the direction markers do not allow for any other coindexing than the ones in the depicted candidates:

(103) **Input:** $[+\text{Nom} +1\ \mathbf{+an}]_1$ $[+\text{Acc} +3\ \text{-obv} +\text{an}]_2$

	PARSE $[+\text{an}]^{[-3]}$	PARSE $[+\text{an}]^{[-3]}$
☞ *-a·* $[+\text{Nom}\ \mathbf{+an}]_1$ $[+\text{Acc}]_2$		*
-eko $[+\text{Nom}]_1$ $[+\text{Acc} +\text{an}]_2$	*!	

(104) **Input:** [+Nom +3 -obv +an]$_1$ [+Acc +1 **+an**]$_2$

	PARSE [+an]$^{[-3]}$	PARSE [+an]$^{[+3]}$
-a· [+Nom +an]$_1$ [+Acc]$_2$	*!	
☞ *-eko* [+Nom]$_1$ [+Acc **+an**]$_2$		*

This approach is straightforwardly extended to other cases where both markers are licensed if we assume the following constraint ranking:

(105) PARSE [+an]$^{[-3]}$ ≫ PARSE [+an]$^{[-def]}$ ≫
PARSE [+an]$^{[+3\ -obv]}$ ≫ PARSE [+an]$^{[+3\ +obv\ +an]}$

Abbreviating this in an obvious way and adding a PARSE constraint for inanimates, which practically – of course – has no effect, it becomes obvious that the ranking of PARSE constraints again reflects a kind of feature hierarchy, closely corresponding to the hierarchies traditionally assumed to trigger Algonquian direction marking (cf. e.g. (146)):

(106) PARSE [+an]$^{[-3] \gg [-def] \gg [+3\ -obv] \gg [+3\ +obv\ +an]\ (\gg [-an])}$

Of course, this is to be expected given the account of other Menominee agreement markers in 7.2.4. In the next sections, I will discuss the remaining direction markers which replace *-a·* and *-eko* in specific contexts.

Concurrence for *a·*: *-am*

-*am* marks transitive predicates with inanimate objects. It is used in all such forms in the conjunct order (107), but only in forms with 3rd person subjects in the unnegated independent order ((108b,c) vs. (108a)), and only in forms with an inanimate actor in the negated independent order (109). In the forms where its appearance is blocked, it is replaced by the already discussed direct marker -*a·*.

(107) Conjunct Order

a. *no·ht-**am**-an*
hear-D-[-3]
'when I hear it' (p. 185)

b. *no·ht-**am**-k* *(no·htah)*
hear-D-[+per]
'when he hears it' (p. 185)

c. *no·ht-**am**-makat-k* *(no·ht-amemakah)*
hear-D-LRS-[+per]
'when it hears it' (p. 185)

(108) Unnegated Independent Order

a. *ne-po·n **-a·**-n*
1-pot:put-D-[+per]
'I put it in the pot' (p. 158)

b. *po·n-**am**-w* *(po·nam)*
pot:put-D-[+3]
'he puts it in the pot' (p. 159)

c. *a·kuaqnє·sk-**am**-makat-w (a·kuaqnє·sk-amemakot)*
shade-D-LRS-[+3]
'it shades it' (p. 159)

(109) Negated Independent Order

a. *ne-po·n-**a**·-n-an*
pot:put-D-[+per]-NEG
'I do not put it in the pot' (p. 173)

b. *o-po·n-**a**·-n-an*
3-pot:put-D-[+per]-NEG
'he does not put it in the pot' (p. 173)

c. *a·kuaqnє·sk-**am**-makat-w-an (a·kuaqnє·skamemakaton)*
shade-D-LRS-[+3]-NEG
'it does not shade it' (p. 173)

The most specific entry for *-am* that is possible in our system is:

(110) *am* ↔ [+Nom][+Acc -an]

The table in (111) shows graphically the relative distribution of *-am* and *-a·*:

(111) Distribution of *-a·* vs. *-am*

	Conjunct	Independent	Negated Independent
-a·			
-am	1/2 → [-an]	1/2 → [-an]	1/2 → [-an]
	3 → [-an]	3 → [-an]	3 → [-an]
	[-an] → [-an]	[-an] → [-an]	[-an] → [-an]

There is no transitive predication where *-am* and *-eko* could compete for realization, since *-am* is licensed for inanimate and *-eko* for animate objects. Thus, what remains to be explained is its distribution w.r.t. *-a·*. If the subject is itself [-an], *-a·* is excluded because its subject specification is [+an]. I assume that there is a general preference for *-am* expressed by a the PARSE constraint in (112) ranked above the constraints in (105):

(112) PARSE [+Acc -an]

If (112) is out-ranked by the following two impoverishment constraints, the full set of data emerges:

(113) a. IMPOVERISH [+Acc -an]$^{[-3]}$ / [+ind]

b. IMPOVERISH [+Acc -an]$^{[+3]}$ / [+Neg]

(113b), of course, will be without effect for [-an] → [-an] forms, where only *-am* is licensed.

Concurrence for *-eko*: *-e* and *-enenϵ*

Two direction markers remain to be discussed: *-e* is licensed by transitive forms with 1st person and *-enenϵ* by forms with 2nd person objects:

(114) *-e* (conjunct order)

a. *nϵ·w-**e**-yan* — 'when you (sg.) see me' (p. 181)
see-D-[-3]

b. *nϵ·w-**e**-t* — 'when he sees me' (p. 181)
see-D-[+per]

(115) *-enenϵ* (conjunct order)

a. *na·tom-**enen**ϵ-an (na·tomenan)*
call-D-[-3]
'when I call you (sg.)' (p. 183)

b. *na·tom-**enen**ϵ-k (na·tomeh)*
call-D-[+per]
'when he calls you (sg.)' (p. 183)

The inverse marker ***-eko*** is used instead if the subject is an indefinite actor or inanimate:

(116) a. *na·tom-**eko**-ϵ-yan (na·tom-ekϵyan)*
call-D-LRS-[-3]
'when I am called' (p. 181)

b. *na·tom-**eko**-yan*
call-D-[-3]
'when it calls me' (p. 181)

As *-am*, *-e* and *-eneneϵ* are blocked in certain constellations where we find them replaced by *-eko*, namely in the independent order if the subject is 3rd person:

(117) Independent Order

a. *ne-na·n-**eko**-w* *(ne-na·nek)*
1-Stamm-INV-[+3]
'he fetches me' (p. 154)

b. *ke-na·n-**eko**-w* *(ne-na·nek)*
2-Stamm-INV-[+3]
'he fetches you (sg.)' (p. 154)

(118) illustrates the relative distribution of *-e*, *-eko* and *-eneϵ*:

(118) Distribution of *-e*, *-eko* and *-enenɛ*

	Independent Order		Conjunct Order	
-e	2	→ 1	2	→ 1
	3	→ 1	3	→ 1
-eko	[-an]	→ 1	[-an]	→ 1
	[-def]	→ 1	[-def]	→ 1
	[-def]	→ 2	[-def]	→ 2
	[-an]	→ 2	[-an]	→ 2
	3	→ 2	3	→ 2
-enenɛ	1	→ 2	1	→ 2

A further detail is relevant: In conjunct order forms with 1st person inclusive, i.e., [+1 +2] objects, *-enenɛ* appears, not *-e*;

(119) *na·tom-en-an-k (na·tomenah)*
call-I-[-3]-PL
'he calls us (inc.)' (p. 183)

Capturing the fact that *e* and *enenɛ* are not licensed by indefinite or inanimate subjects, I will state the vocabulary items as follows:

(120) $e \leftrightarrow$ [+Nom +def +an] [+Acc +1]

$enen\epsilon \leftrightarrow$ [+Nom +def +an] [+Acc +2]

I will again assume that the conjunct represents the default constellation and that the different distribution in the independent is derived by impoverishment constraints. To start with, the choice for *-enenϵ* in (119) follows without further stipulation from the already established ranking in (121):

(121) PARSE [+2] $\gg$ PARSE [+1]

If these constraints are ranked higher than the constraints in (105), this accounts for the preference of *-e* and *-enenϵ* in (114) and (115), where also *-eko* and *-a·* would be licensed, since all arguments are animate. The different distribution in the independent is captured by the higher ranked impoverishment constraint:

(122) IMPOVERISH [+def] / [+ind] [+Nom +3]

[+def] identifies exactly *e* and *enenϵ*. (123) recapitulates the VI entries for all direction markers, and (124) the ranking of the assumed constraints:

(123)	*am*	↔	[+Nom]	[+Acc -an]
	e	↔	[+Nom +def +an]	[+Acc +1]
	enenε	↔	[+Nom +def +an]	[+Acc +2]
	a·	↔	[+Nom +an]	[+Acc]
	eko	↔	[+Nom]	[+Acc +an]

(124) IMPOVERISH [+def] / [+ind] [+Nom +3] $\gg$
PARSE [+2] $\gg$ PARSE [+1] $\gg$
IMPOVERISH [Acc -an]$^{[-3]}$ / [+ind] $\gg$
IMPOVERISH [Acc -an]$^{[+3]}$ / [+Neg] $\gg$
PARSE [Acc -an] $\gg$
PARSE [+an]$^{[-3] \gg [-def] \gg [+3\ -obv] \gg [+3\ +obv\ +an]\ (\gg [-an])}$

7.3.4 Other Formal Accounts of Direction Marking

All the accounts to be discussed in the following are based on Potawatomi and report only four direction markers which correspond, however, closely to the core markers of Menominee:

(125) Insertion Contexts in the Independent Order

Insertion Contexts	Menominee	Potawatomi
$1 \rightarrow 2$	*-enenɛ*	*-n*
$2 \rightarrow 1$	*-e*	*-y*
$3 \rightarrow 1{,}2$ [obv] $\rightarrow 3$	*-eko*	*-ukO*
$1{,}2 \rightarrow 3$ $3 \rightarrow$ [obv]	*-a·*	*-a*

A further difference between the two languages that is of relevance for our discussion is the position of negation w.r.t. and its effects on agreement marking.

Of the discussed analyses only Halle and Marantz (1993) include in their description negated forms, and none of them includes conjunct order forms, which play a crucial role in the given DO analysis. Keeping these differences in mind, my strategy will be to take the existing analyses mutatis mutandis as if they would refer to Menominee and show their limitations.

Anderson (1992)

Let us look just at one affix representation from Anderson (1992:172), that of -*ukO* which corresponds to Menominee -*eko*[17]:

(126)
$$\left\{\begin{array}{ll} \begin{bmatrix} +Nom \\ +Obv \end{bmatrix} & \begin{bmatrix} +Acc & \begin{array}{l} +Obv \\ +Anim \end{array} \end{bmatrix} \\ \begin{bmatrix} +Nom \\ -1 \\ -2 \end{bmatrix} & \begin{bmatrix} +Acc \left\{ \begin{array}{c} +1 \\ +2 \end{array} \right\} \end{bmatrix} \end{array}\right\}$$

$$\begin{array}{lcl} [\text{+Nom 1}]\ [\text{+Acc 2}] & \rightarrow & [\text{+Nom 2}]\ [\text{+Acc 1}] \\ /\text{X}/ & \rightarrow & /\text{XukO}/ \end{array}$$

Note that the part in parentheses is the condition which triggers the rule, while the rest specifies the operation that applies. Apart from the suffixation of -*ukO* (last line), the rule exchanges object and subject features. This seemed to most reviewers a rather strong rule format. There is, however, another point which makes this analysis highly objectionable. It simply sums up in a SPE-disjunction format all combinations in which -*ukO* appears: [+obv] → [-obv], [+3] → [+1] and

[17] Anderson revises this rule later in the same chapter (p. 177), but in respects irrelevant for the discussion here. Again, details, such as the feature representation are adapted to the conventions of this thesis.

[+3] → [+2]. Carrying over this analysis to Menominee, further constellations would have to be added: [-def]→ [+1], [-def]→ [+2] and [-an]→ [+an]. Summing up contexts in this way, we seem to learn nothing about the underlying working of the system. Another problematic point is the interaction with the rule introducing -*n*, which corresponds to Menominee -*enene* (ibid:177):

(127) [+Nom][+Acc +2] /X/ → /Xn/.

The representation is rather near to the one proposed in 7.3.3. But (127) is ordered in a rule block after (126); hence, we would not expect that (126) "fails" to apply in certain context, which is the case for the corresponding Menominee marker -*eko* in 3 → 1/2 conjunct order forms.

Steele (1995)

Steele (1995) reanalyzes the data discussed by Anderson using a lexicalist version of processual morphology, where the basic idea is that rules add affixes and morpho-syntactic specifications, such as agreement features, at the same time – constrained only by general constraints on redundancy and affix- (i.e. rule-) specific input restrictions. The rule that introduces -*uko*, thus, takes the following shape (ibid:282):

$$\text{(128)}\quad \overset{Y}{[+Nom]\begin{bmatrix} +Acc \\ +an \end{bmatrix}} \rightarrow \overset{Xuko}{\begin{bmatrix} +Nom \\ +\mathbf{3} \end{bmatrix}\begin{bmatrix} +Acc \\ +an \end{bmatrix}}$$

while *-a·* is introduced by:

$$\text{(129)}\quad \overset{Y}{[+Nom]\begin{bmatrix} +Acc \\ +/-an \end{bmatrix}} \rightarrow \overset{Xa}{[+Nom]\begin{bmatrix} +Acc \\ +/-an \\ +\mathbf{3} \end{bmatrix}}$$

As in the DO analysis, these rules are ambiguous in the sense that they could both lead to 3 → [+obv] or to [+obv] → 3 forms. In the DO account, this indeterminacy was resolved by PARSE constraints. Steele solves the problem by stipulating for a different set of affixes which introduce the obviative feature that this feature must be linked to a feature structure specified by a previous affix as [+3]. Since, at the stage where the obviative affixes are attached, the only [+3] specifications available are those introduced by (128) and (129), [+obv] is linked to the subject for *-uko* and to the object for *-a*, as required. While this works, it implies the problem that [+obv] might be introduced by different affixes. In Menominee, in most transitive verb forms, there is no overt affix for this feature:

(130) *na·n-ek-w* *(na·nek)*
fetch-I-[+3]
'the other fetches him' (p. 154)

However, in the 3 → [+obv] form of the conjunct, a special obviative affix appears:

(131) *nε·w-a·-t-en* *(nε·wa·cen)*
see-D-[+3]-[+obv]
'when he sees the other' (p. 180)

In the corresponding independent form, *-a·* is replaced by the allomorph *-ε·*:

(132) *na·n-ε·-w* 'he fetches the other' (p. 152)
fetch-I-[+3]

While we can assume in a DM architecture that this is the result of a morpho-phonological readjustment process, this has to be done by a rule referring in some way to [+obv] in Steele's framework. Since for her all operations are feature adding, this rule also must introduce the feature. In effect, we need three different rules that link [+obv] to [+3]. While this is no technical problem, it means that the mechanism that ensures the proper use of *-eko* and *-a·* has to be present three times in the grammar. The same point could be made for other cases where the specifications of direction markers have to overlap as for -*eko*, -*e* and -*enenє*, or -*a·* and -*am*.

Halle and Marantz (1993)

Halle and Marantz (1993) assume that -*a* and -*ukO* represent a separate agreement head ("Agr_1") adjoined to a functional head that represents the order category ("Ind") and agreeing with non [-obv] DP arguments. To understand the latter statement, it is important to note that they posit a three-way distinction for obviation:

(133) "[+obv], [-obv] and unmarked for obviation. 1st and 2nd person pronouns ... are always marked [-obv]. 3rd person DPs may be marked [+obv] for discourse reasons or left unmarked, ... in clauses with 3rd person DPs as both subject and object arguments, one of the 3rd person DPs must be specially marked [-obv] and the other must be marked [+obv]" (p. 141/142).

This means that Agr_1 will agree with the object in direct (1,2 $\rightarrow$ 3 and 3 $\rightarrow$ [+obv]) and with the subject in inverse (3 $\rightarrow$ 1/2 and [+obv] $\rightarrow$ 3) configurations:

(134) Potawatomi Agreement Configurations in Halle and Marantz (1993)

Subject	Object	Agr_1 agrees with ...
1 [-obv]	2 [-obv]	none
2 [-obv]	1 [-obv]	none
1/2 [-obv]	3 ([+obv])	object
3 [-obv]	3 [+obv]	object
3 ([+obv])	1/2 [-obv]	subject
3 [+obv]	3 [-obv]	subject

Consequently, *-ukO* is restricted to the feature +Nom and *-a* is the default realization for Agr_1 (p. 148):

(135) [Agr_1 + Ind]

$$\begin{array}{lcll} [+\text{Nom}] & \leftrightarrow & /\text{-ukO}/ & /\ [+\text{trans}]\ \_\_ \\ [\quad\ ] & \leftrightarrow & /\text{-a}/ & /\ [+\text{trans}]\ \_\_ \end{array}$$

where [+trans] stands for "transitive verb" and serves i.a. to block these two affixes in intransitive contexts. The alert reader might wonder what happened with *-y* and *-n*. These are not viewed as exponents of Agr_1, but introduced by specific readjustment rules. In the following, I will show that this analysis cannot account satisfactorily for the data in Menominee.

Note first that the analysis involves a number of representations and mechanism which are quite unusual. So, for agreement, there is an agreement head which is neither subject nor object agreement but chooses its agreement source w.r.t. a specific feature. Moreover, the feature specification that is responsible for the choice of agreement is a three-valued feature ([obv]), where the only motivation for the third value is to account for the problem at hand. Reference to the obviation feature, moreover, is in a negated context: "not [-obv]".

Second, the account leaves it under-determined, what obviation features and agreement look like with inanimate arguments, as in:

(136) *k-wapt-nawa* 'they see it' (p. 153)
2-see-D-PL

Since -*a* is chosen, agreement is with the object which must hence not be [-obv] But what about the subject? The point gets clearer if we turn to Menominee.

(137) *nϵ·qn-eko-n* 'it kills the other' (p. 154)
kill-I-[+per]

Since agreement is with the subject, this must also be non [-obv]. But the same also holds for the object, which is explicitly [+obv]. In the mirror constellation ([+obv] → [-an]), agreement is with the subject, hence, again, the inanimate argument:

(138) *o-po·n-**a**·-n-e·n-an*
3-pot:put-D-[+per]-[+obv]-NEG
'the other does not put it in the pot' (p. 173)

So, what would be needed is a mechanism that chooses agreement with a [-an] argument over a [+an] one if both are [+obv], and it is unclear how such a mechanism could look like. The same basic problem arises with indefinite actor forms:

(139) a. *ne-na·tom**-ek-ϵ·-m*** 'I am called' (p. 155)
call-D-[-lrs]-[-3]

b. *na·n **-a·-w-an*** 'the other is fetched' (p. 152)
fetch-D-[+3]-[+obv]

From (139a), we conclude that the indefinite actor is not [-obv] since agreement is with the subject. But this means that in (139b) both arguments are candidates for agreement with Agr_1. We could hypothesize that the indefinite actor in (139b) is [-obv], as all 3rd person arguments in the context of a [+obv] one; but then, the subject in

(140) should be [+obv], for which there is no evidence:

(140) *na·n*-***a·-w*** 'he is fetched' (p. 152)
fetch-D-[+3]-[+obv]

Of course, a rule could be stipulated that renders a [-def] argument [+obv] in the context of an 1/2 object and [-obv] with a 3rd person object. The point is that we need again an additional technical device which makes reference to the combination of subject and object and that +/-obv becomes a kind of diacritic feature to trigger direction marking. If we assume that direction markers are portmanteaus, this diacritic is superfluous because affixes can directly refer to agreement information from subjects and objects, and the mechanisms which force choices between concurring VIs are simply standard constraints of morphology (PARSE and IMPOVERISHMENT).

Now, as we saw in (118), -*e* and -*enenϵ* take over the role of -*eko* in certain contexts of the conjunct order. On the other hand, the most basic generalizations that we can state for these is that -*e* appears with [+1] and -*enenϵ* with [+2] objects. Hence, they must realize (at least) object agreement. But if Agr_1 agrees with the subject (but not the object) in $3 \rightarrow 1$ constellations (where -*eko* appears in the independent order), -*eko* cannot be replaced in this context by -*e* which spells out agreement features of the object.[18].

In fact, Halle and Marantz do not treat Potawatomi -*y* and -*n* as realizations of the same head, but as the result of readjustment rules introducing segmental material. Their main argument for doing so is that in Potawatomi -*a* (≈ Menominee -*a·*)) and -*ukO* (≈ -*eko*) appear before the negation element -*s'* while -*y* (≈ -*e*) and -*n* (≈ -*enenɛ*) appear after it (Halle and Marantz, 1993:165):

(141)	a.	*n-wapm-a-s'i* 1-see-D-NEG	'I do not see him'
	b.	*k-wapm-us'-i-mun* 2-see-NEG-D-1pl	'you do not see us'

Even in Halle and Marantz' (1993) framework, this is not a decisive argument against treating the two groups of direction markers as belonging to essentially the same affix type.[19] In DO, it is much less since for agreement heads different positions are possible if the feature content of the affixes differs. In Menominee, no comparable evidence exists. Negation appear outside all agreement morphology:

[18] +1 cannot be part of a local context restriction since there is no OAgr.

[19] This could be effected e.g. by local dislocation. see 5.2.3 for discussion.

(142) *ke-nε·w-e-n-i·naw-an*
2-see-D-[+per]-1pl-NEG
'you (pl.) do not see us' (p. 171)

More importantly, the replacing of *-eko* by *-e* and *-enenε* in the conjunct provides strong support for the subsumption of all direction markers under the same affix type, which remains inexplicable if part of them are agreement markers and the other part results of an independent readjustment rule.

McGinnis (1995) offers a DM account of Ojibwa, another closely related Algonquian language, which differs in many details from the one of Halle and Marantz but shares with their account that the distribution of the direction markers is determined by a single feature specification ("not [-obv]"), and that direction markers are divided into two disjoint groups (for her *-igw* ≈ *-eko* vs. the other three) whose complementary distribution is the result of a rule conspiracy. Mutatis mutandis the same critics apply to her account.

Wunderlich (1996)

Wunderlich, in his analysis of Potawatomi in the framework of Minimalist Morphology, incorporates direct reference to a feature hierarchy into the lexical entries for direction markers (Wunderlich, 1996:290):

(143)

	direct markers		inverse markers
/y/	<[+1],[+la]>	*/n/*	<[+1],[+Acc +la]>
/a/	<[ ],[+la]>	*/ukO/*	<[ ],[+Acc +la]>

The brackets ("[,]") are meant as positions on the hierarchy:

(144) [+2] > [+1] > [+3] > [+obv] > [-an].

The feature [+la] ("lower animate") means that there is another argument lower in the hierarchy than the argument to which the feature structure refers. Thus, <[+1],[+Acc +la]> means in effect that there is an accusative argument and another argument (in consequence nominative) which is lower in the hierarchy. Since only [+2] is higher than [+1], the accusative argument has to be [+2]; we get [+1 Nom] [+2 Acc].

Apart from formal details which remain unclear, the intention is that these entries denote asymmetries between arguments w.r.t. a hierarchy. This, of course, is exactly the extension of formal apparatus that the minimalist account of direction marking seeks to avoid. To permit a fuller examination of the approach, let us see how Wunderlich's account has to be modified to fit the data from Menominee.

First, *-enenϵ* and *-e* – occurring in the conjunct with 3rd person subjects – cannot be characterized as the corresponding affixes in (143) which means in effect 1 → 2 and 2 → 1. To represent their full insertion potential and to exclude them for indefinite actor forms, their representation must be likened to the one proposed in (120):

(145)

	direct markers		inverse markers
-e	<[+def +an],[+Acc +1]>	*-enenɛ*	<[+def +an],[+Acc +2 +la]>
-a·	<[ ],[+la]>	*-eko*	<[ ],[+Acc +la]>

Second, to capture the distribution of indefinite actors, we have to extend the assumed hierarchy. Recall that [-def] subjects lead to inverse forms with 1/2 objects and to direct ones with all 3rd person objects, which means that it has to be situated between +2 and +3:

(146) [+2] > [+1] >[-def] >[+3] >[+obv] > [-an]

While Wunderlich for Potawatomi explicitly excludes the possibility of subject and object having the same animacy status, such forms in Menominee clearly exist[20] and also appear with a direction marker:

[20]Fabri (1996:21) cites examples from Cree with two obviative arguments, where inverse and direct marking is possible.

(147) *a·kuaqnϵ·sk**-am-makat-w** (a·kuaqnϵ·skamemakot)*
shade-D-LRS-[+3]
'it shades it' (p. 159)

This means that we have to loosen the notion of direction at least for this marker by something like a feature [+nh] ("there is **n**o argument **h**igher in the animacy hierarchy.") *Third*, there cannot be a unique ranking of [+2] and [+1] in Menominee. To see this assume there were such a ranking. If there is any substantial content to the notion "inverse" then the constellations 3 $\rightarrow$ 2 and 3 $\rightarrow$ 1 must be inverse. If -*enenϵ* and -*e* are direction markers, they must be inverse markers since they appear in inverse constellations in 3 $\rightarrow$ 1 and 3 $\rightarrow$ 1 forms in the conjunct order. Now what about the ordering in the hierarchy of [+1] and [+2]? [+1] must be higher than [+2] since [+Nom +2][+Acc +1] is marked in all contexts by -*e* which is, as we saw, an inverse marker. At the same time, [+2] must be higher than [+1] because 1 $\rightarrow$ 2 forms are alway marked by -*enenϵ* which is also an inverse marker. Thus, assuming that [+1] and [+2] are strictly ordered in a hierarchy, leads to a contradiction. This means that we have to modify the hierarchy into:

(148) [+2], [+1] >[-def] >[+3] >[+obv] > [-an]

At the same time, we have to replace [+la] in the entries for -*enenɛ* and -*e* by [+nh], since they cover $1 \rightarrow 2$ and $2 \rightarrow 1$ – according to (148) symmetric predications – as well as [-an] $\rightarrow$ [-an]. Further provisions have to be made to ensure that the distribution of direction markers differs in different contexts (conjunct and negation).

Since it is not clear how this would look like, a comparison of the approaches still remains problematic. Both accounts use highly underspecified entries for the direction markers and refer to feature-based hierarchies, which is a constraint-hierarchy in DO and a feature-hierarchy in the MM analysis. For these reasons, I will restrict myself to two points: How minimal are the representations of direction markers and: Should hierarchies refer directly to features or to constraints referring to features?

Let us start with some subtle points returning to languages with inverse but without direct marking (7.3.2). In DO, the inverse marker is represented as (149a); in MM, it would presumably be equivalent to (149b):

(149) a. [+Nom] [+Acc]

b. <[ ],[+Acc +la]>

These representations both use two features, hence seem of equal complexity. Note however that the MM representation is in fact richer, since the MM notation <[ ],[ ]> implies that there are two arguments of the verb, where each [ ] refers to a distinct argument, while the DO notation [ ][ ] implies only that there is an input form, which is redundantly true for all uses of an affix. Thus, in a sense, (149b) contains a third feature which might be called in MM parlance +ta "there are **t**wo **a**rguments". On the other hand, the representation of a direct marker, as in Menominee, is in DO slightly complexer than in MM:

(150) a. [+Nom +an] [+Acc]
 b. <[ ],[+la]>

I think this state of affairs indicates that the DO account is on the right track. Recall that direct marking is rather rare. Thus the unmarked direction marker is in fact an inverse marker, which has the maximally simple representation in DO, but not in MM. Of course, these are subtleties and feature counting hardly gives a decisive argument in favor of one approach over the other. There is however a level at which the MM representations are clearly richer, i.e., more complex than the ones in DO, namely the logical apparatus used. Recall that two feature structures in the MM representation of direction markers already imply the existence of two arguments, while no such claim follows from the DO representation. In both accounts feature sets (F_1 and F_2 in (151)) imply that there are "underlying" (or paradigmatic) units that are subsumed by the given feature structures:

(151) a. $<[F_1],[F_2]>$: $\exists X, \exists Y$: subsumes($[F_1]$,X),subsumes($[F_2]$,Y), $X \neq Y$

b. $[F_1],[F_2]$: $\exists X, \exists Y$: subsumes($[F_1]$,X),subsumes($[F_2]$,Y),

Note that existential quantification and the subsumption predicate is all there is in an DO VI. In MM VIs, we find in addition (non-)equality (151b) negation (152b) and relational predicates (152a), as becomes clear if we look at the information conveyed by more realistic direction markers.[21]:

(152) a. $<[\ ],[+la]>$: $\exists X, \exists Y$: lower(animacy, X,Y)

b. $<[\ ],[+nh]>$: $\exists X, \exists Y$: $\neg$ higher(animacy, X,Y)

While single representations of direction markers in MM are roughly as minimal as in DO, this goes hand in hand with considerably stronger assumptions about the things that are possible in lexical representations of affixes. Note that MM also makes use of portmanteau repre-

[21] lower(h, X, Y) (higher(h, X, Y)) means that X is lower (higher) than Y on hierarchy h.

sentations (Lakämper and Wunderlich, 1998:122 ff.).

Apart from the formal aspect, there are also empirical differences with the representations Wunderlich proposes. Imagine a language which has only a MM direct marker as (150-b), hence the most simple direction system, according to the representation of the direction marker. Interestingly, this would not result in a language marking only direct predications by direction markers: Since [+la] only implies that one argument is higher in the hierarchy than the other, in this language, direct *and* inverse (but not symmetric) predications would be marked by the same affix. Such a language however seems not to exist.

Of course both approaches have additional devices. Again a comparison is difficult because the use of impoverishment constraints in DO is motivated by facts that are not accounted for at all in the MM analysis: the asymmetry of direct and inverse marking (cf. 7.3.2) and the different distribution of Menominee direction markers in different contexts. Anyway, the main difference between the approaches seems to be the encoding of asymmetries between features which is done by feature hierarchies in MM and by constraint hierarchies in DO. This is most obvious in comparing (148) and (106) repeated here as (153a) and (153b):

(153) a. [+2], [+1] >[-def] >[+3] >[+obv] > [-an]

b. PARSE $[+\text{an}]^{[-3] \gg [-\text{def}] \gg [+3\ -\text{obv}] \gg [+3\ +\text{obv}\ +\text{an}]\ (\gg [-\text{an}])}$

Wunderlich's argument in favor of a feature hierarchy is that it is independently motivated by other aspects of Potawatomi inflection. But, as we saw in 7.2.4, as far as affix realization in Menominee is concerned, this cannot be strictly true since there are cases in affix selection where [+3] takes precedence over [-3] and others where [+1] outranks [-1], which speaks against any unitary feature hierarchy responsible for affix selection under blocking. The examples Wunderlich adduces can be accounted for without any reference to a hierarchy or are not tenable given the feature ranking that has to be assumed for Menominee. Thus, he argues that the hierarchy governs the distribution of number markers in Potawatomi, e.g. the plural suffix appearing in 2pl transitive forms with a distinct 3rd person argument /-wa/ is characterized as [+la] (Wunderlich, 1996:290f.). But this could, equally well, be characterized by requiring a [+3] argument in the context restriction of /-wa/.[22] The assumed hierarchy is also claimed to be independently "evidenced by the distribution of clitics. Whenever a 2nd person is marked in one of the verb's suffixes /k/ (= [+2]) takes precedence over /n/ = ([+1])" (ibid:289). But in Menominee, the same distribution of

[22]This is also consistent with its use as a third person possession marker.

k- and *n*- obtains while, as I have shown, the hierarchy reflected in the direction markers cannot have any ordering for +2 and +1.

Interestingly, in the DO account, there is a hierarchy ranking +2 over +1 which is responsible both for the distribution of prefixes and direction markers (see (121)). This is readily expressed in the approach given here, but not in the MM account.

7.4 Related Systems

Given the assumption that direction affixes are (portmanteau) agreement markers, we should expect a continuum between the markers that traditionally firm under the heading portmanteau agreement and "classical" direction markers. On the contrary, an account which resorts to explicit mechanisms to represent direction suggests that there is a basic difference between the two classes. Contrasting two prototypical instances of both, such as the Quechua portmanteau agreement marker -*q* discussed in 3.2.3 and the Menominee inverse marker -*a·*, we find the following contrasts:

- Portmanteaus mark very specific feature combinations while direction markers stand for relatively abstract sets of feature combinations.

- Direction Markers mark (un)natural transitive predications, portmanteaus are blind w.r.t. such distinctions.
- Portmanteaus replace standard agreement, i.e. they bleed the markers used elsewhere. Direction markers supplement standard agreement.

We have already seen that the first point cannot be completely true: In Menominee and Palaeosiberian, there are direction markers specifying a great wealth of additional agreement features. In this section, I discuss further agreement systems which show that there are cases falling somewhat inbetween these characterizations. In Arizona Tiwa (7.4.1), there are agreement affixes showing much differentiation in features and bleeding other (intransitive) agreement. Nonetheless, these affixes have the functionality of a direction marking system. In Dumi (7.4.2), there is an affix claimed to mark an unnatural predication type in the descriptive literature, but which is unequivocally a portmanteau, since its distribution cannot be reduced to any feature hierarchy. Finally, in 7.4.3 some related markers are discussed which seem to be problematic for the proposed account.

7.4.1 Arizona Tewa

The proposed account suggests that in languages with direction marking virtually all person combinations should be markable by portmanteau affixes, which might lead to systems with large paradigm of direction markers. Such cases indeed exist. A case in point is Arizona Tewa which is claimed by Klaiman (1993) to mark direction by the choice of specific paradigms instead of overt markers. The agreement affixes for AT are given in (154) and (155) (Klaiman:350-51):

(154)

SET III		**SUBJECT**		
		1	**2**	**3**
	1		*dí*	*dí*
	2	*wí*		
	2sg			*wóː*
	2du			*wóːbén*
OBJECT	**2pl**			*wóːbé*
	3sg			*'óː*
	3du			*'óːbén*
	3pl			*'óːbé*

(155)

	1sg	1du	1pl	2sg	2du	2pl	3sg	3du	3pl
SET I	*'o-*	*ga-*	*gi-*	*'ų-*	*da-*	*'i-*	*na-*	*da-*	*di-*
SET II	*dó-*	*'án-*	*'íː-*	*'náː-*	*den-*	*'obíːn-*	*mán-*	*den-*	*dí-*

SET I affixes are used in intransitive forms, those of SET II with transitives and 3rd person objects, and those of SET III with transitives and 3rd person subjects. For 3 → 3 predications, SET II and SET III affixes are possible, but with slightly different interpretations. I will assume that the choice between them is governed by an obviation feature comparable to that familiar from Algonquian, where in a transitive sentence the two arguments are always assigned opposite values, and SAP arguments are always -obv. Thus, the subject (in both sentences "that man") is [-obv] in (156a) and [+obv] in (156b) while the object has the complementary values respectively (data from Kroskrity, 1985:309):

(156) a. *Hę'i sen nέ'i 'enú mán-k^{hw}ę́di*
that man this boy 3sg:II-hit
'That man hit this boy'

b. *Nę́'i 'enú hę'i sen-di 'oː-k^{hw}ę́di*
this boy that man-OBL 3:3SG:III-hit
'That man hit this boy' ('This boy was hit by that man')

The analysis I propose is very simple: Apart from the 3 → 3 affixes all SET II affixes have the form [+Nom X] [+Acc +3], where X is the corresponding feature specification in (155). 1pl *'í-* is thus:

(157) */'íː-/* ↔ [+Nom +1 +pl] [+Acc +3]

SET III affixes, with the exception of *dí* and *wí*, have the form [+Nom +3] [+Acc X], e.g. for a 2nd person object:

(158) */wóː/* ↔ [+Nom +3] [+Acc +2]

while I take *bén* and *bé* to be separate number markers.

The 3 → 3 affixes are kept apart by reference to the obviation features. Thus the sg affixes from (156) are represented as:

(159) */mán/* ↔ [+Nom +3 -obv] [+Acc +3 +obv]
/'óː-/ ↔ [+Nom +3 +obv] [+Acc +3 -obv]

The specification for *dí* and *wí*, as might be expected, is also in a portmanteau manner:

(160) */dí/* ↔ [+Nom -1] [+Acc -2]
/wí/ ↔ [+Nom +1] [+Acc +2]

Note that *dí* now subsumes all three homonym forms found in the paradigms. Under competing portmanteaus, it is plausibly blocked by the SET II affixes specified for subject number[23] and the 3 → 3 affixes of SET III specified for object number. All the affixes competing with *dí* are also specified for +/-obv, which means that a high-ranked PARSE [+OBJ] will disfavor *dí* when an other portmanteau is available. Recall finally from section 2.2.6 that in forms with two SAP arguments all number features are impoverished, which guarantees the occurrence of *dí* in all 2 → 1 forms.

I propose that the passive-like character of the different affix sets also derives from an impoverishment constraint that blocks surface realization of number features which are associated with an underlying +obv category. This means that *bé* [+Acc +pl -1] and *bén* [+Acc +pl -1 +du] can only surface with *wó:* [+Nom +3 +obv] [+Acc +3] and *ó:* but not, for example, with a SET II affix as *den-* [+Nom +2 +du][+3] (to express a 2 → 3 predicate) where the subject is by assumption [-obv] and the object [+obv]. This also blocks the insertion of a SET I affix in addition to one of SET III, which would be otherwise licensed by the additional number features of the subject.

Compare this to the analysis informally proposed by Klaimann, where she assumes that agreement markers are grouped into an inverse

[23] I assume *mán-* to be specified positively for +sg.

and a direct paradigm and that direction marking is a kind of meta-device that chooses in each case an affix from the appropriate set. Formalized, this would mean the introduction of otherwise un-motivated features to identify the affix sets and a new constraint mechanism to ensure the correct choice for each case. Empirically, this analysis leads to a loss of obvious generalizations because one has to assume at least two homophone affixes *dí*, one for each affix set and has to interpret the marking of 2nd and 3rd non-singular objects as single affixes while these clearly have to be segmented for a dual affix *bé-* and a plural affix *bén-*.[24] Finally, this type of analysis does not capture the fact that in "inverse" predications (SET III), object number is marked,[25] but not subject number and the opposite holds for the "direct" affixes of SET II. Note also that portmanteaus are necessary even under a Klaimann-style account for *wí* to ensure its correct distribution.

7.4.2 Dumi

The Dumi "marked scenario prefix" (van Driem, 1993:123) *a-* occurs in

(161) "all scenarios involving a first or second person actant except

[24] Or *bé-* might be taken as +pl and *n-* as +du, where underlying dual also has +pl.

[25] An exception are the $1 \rightarrow 2$ and $2 \rightarrow 1$ forms.

those with a first person agent or subject."

This partitions all transitive and intransitive predications of the language into the two sets shown in (162). The marked scenario thus comprises configuration which would be characterized as inverse ($3 \rightarrow 1$) as well as direct ones ($2 \rightarrow 3$), excluding a simple account based on any hierarchy.

(162) Distribution of *a*-

marked (*a*-)	**unmarked**
$2 \rightarrow 1$	$1 \rightarrow 2$
$3 \rightarrow 1$	$1 \rightarrow 3$
$3 \rightarrow 2$	$3 \rightarrow 3$
$2 \rightarrow 3$	1
2	3

This leads Bynon (1998) to conclude that in Dumi there are really two homophonous prefixes *a*-:

(163) The presence of prefixed *a*- in second person intransitives as well as in the semantically direct $2 \rightarrow 3$ would be inexplicable if there were only an inverse prefix . . . We conclude that a case

> can be made for differentiating second person *a-* from inverse marking *a-* on semantic grounds ... (p. 90/91)

At first glance, also a portmanteau account seems excluded since there is no unique feature characterizing "marked scenario" objects; indeed, all persons are represented in (162) and something like [+Nom -1][+Acc] would predict the prefix for cases of $3 \rightarrow 3$, where it does not appear. Worse, *a-* also appears in intransitive forms, which seems to exclude a specification for +Acc altogether; however, single feature structures also fail to capture the distribution of the affix. [+Nom +2 -1] excludes incorrectly $3 \rightarrow 1$ and $3 \rightarrow 2$. [+Nom -1] predicts its occurrence in 3rd person intransitive forms, again counter to fact. The solution I propose is a portmanteau, where the second feature structure is not specified for case namely:

(164) *a* $\leftrightarrow$ [+Nom -1][-3]

This parses 2nd person subjects in transitive and intransitive forms, indeed this is the exact specification for a 2nd person subject, but distributed into two feature structures. All "marked" subjects in (163) are [-1], and every "marked" configuration contains the feature [-3] in subject or object position. Thus, *a-* is licensed by all of these contexts. On the other hand, obviously all 1st person subjects are excluded.

3rd person intransitive subjects and the $3 \rightarrow 3$ constellation would mean that [-3] is not licensed. All unmarked constellations are hence excluded.

Dumi, indeed, has an even broader set of portmanteaus. In 1sg $\rightarrow$ 2 forms, we find the otherwise absent suffix -*N*, and in the non-preterite there is a marker expressing nonpast and 1sg $\rightarrow$ 3sg. Thus, the only person combination where systematically no portmanteaus occur is 3 $\rightarrow$ 3. This, of course, is captured by the impoverishment constraint for this situation proposed in 7.3.2, and we have here the case where only this constraint is ranked over the other impoverishment constraints responsible for the more classical distribution of direction markers in asymmetric contexts.

7.4.3 Some Loose Ends

Let us finally turn to some cases which seem genuinely difficult for the account proposed here.

Nunggubuyu

In Nunggubuyu, there is an unusual direction marker (Heath, 1984; Noyer, 1992:296): -*n* is inserted between an object and a subject affix if the object is higher on the hierarchy:

(165) [+participant] > [+aug] > GENDER > CLASS

Considerably simplifying Noyer's analysis, [+aug] stands for non-singular categories and CLASS for non-human genders as the one labeled ANA by Heath:

(166)
a. *(wa-ɯɻu* →) *wa-n-ɯɻu* 'ANA → 3nsg'
b. *(ŋa-wi* →) *ŋa-n-wi* '3nsg → 1sg'

There seems to be no way to get the insertion conditions by a portmanteau. Crucially however it is not necessary to relate the appearance of *-n* directly to the hierarchy. In fact, there is another process reflecting the hierarchy. While subject affixes generally precede object affixes, the order is reversed if the object is higher in (165). This makes it possible for Noyer to account for the distribution of *-n* by the following rule:

(167) **Inverse Insertion**

$\emptyset \rightarrow$ [-n- $_{INV}$]/ $_{OBJ}$] — [$_{SUB}$

It is not obvious how this can best be translated into DO terms, but I will sketch one possibility: Suppose that *-n* is a minimal direction marker namely [+Nom][+Acc]. Since the other affixes of Nunggubuyu are not case-marked, this would ensure its insertion if not blocked by other constraints. Assume further that it is restricted by context restrictions to the immediate right of an object and the left of a subject marker. If the PARSE constraint for case features is ranked lower than all the ordering constraints, this will lead to non-parsing of case features, i.e. the non-appearance of *-n*, if subject precede object markers.

Southern Tiwa

In Southern Tiwa (Rosen, 1990) passivization, is obligatory for certain person combinations if one would expect transitive agreement. Thus, combinations of [+3] subjects and [-3] objects have to be expressed by passive forms:

(168) *Pĩrude-ba* *te-khoake-ban*
snake-INST S1s-bite-PASS:PAST
'I was bitten by the snake' (p. 676)

Whatever the correct analysis for this phenomenon is, it seems non-interpretative in nature since it leads to gaps in the paradigm of transitive forms. According to the assumptions of this thesis, this means that the mechanism responsible for the Southern Tiwa pattern is located in the pre-spell-out component of the grammar, hence in syntax. Since it is one of my basic claims that feature hierarchies surface in different ways even in a single language, it is also natural to see such effects in other modules of grammar.

7.5 Summary

What seems common to all direction marking languages is that the expression of agreement depends more on features like person, obviation and animacy than the case roles of arguments. This is also true for the expression of non-direction markers and affix order (see e.g. the discussion of Menominee in 6.2.5). In the account given here, this is related to the expression of case features by portmanteau affixes supplemented by case-less affixes expressing the "remaining" feature content. While traditional accounts claim that languages of this type follow a fixed feature hierarchy, it was shown that different domains even in a single language involve different hierarchies. This suggests that feature hierarchies are not explicitly represented in grammars but reflected in particular rankings of universal constraints.

Appendix A

Abbreviations

1	first person
2	second person
3	third person
X → Y	X subject/Y object
X:Y	X subject/Y object
ABS	absolutive
ACC	accusative
ACT	active voice
A(gr)	agreement
AN(IM)	animate

AP	adjective phrase
ASP	aspect
AOR	aorist
AUX	auxiliar
AUSTR.	Australia
CE.	Central-East
CAUS	causative
Ch.Kamchatkan	Chukotko-Kamchatkan
COH	coherent
D(IR)	direction marker
DECL	Declensional Class
DEF	definiteness marker (Albanian)
DM	Distributed Morphology
DO	direct object/Distributed Optimality
DP	determiner phrase
DU	dual
exc.	exclusive
ERG	ergative
F(EM)	feminine
FS	feature structure
FUT	future

GPast	General Past (Fula)
GUI.	Guinea
HAB	habitual
IMPF	imperfective
INAN(IM)	inanimate
inc.	inclusive
IND	indicative
I(NV)	inversion
IO	indirect object
INST	instrumental
LD	left dislocation
LI	lexical item
LOC	locative
LRS	low referential status (Menominee)
M(ASC)	masculine
M.-Polynes.	Malayo-Polynesian
MM	Minimalist Morphology
MDM	Minimalist Distributed Morphology
MS	marked scenario affix (Dumi)
NEG	negation
NOM	nominative

NAC	non-active
N(UM)	number
N.	North(ern)
NPast	non-past
Nsg	non-singular
O(Agr)	object (agreement)
OBV	obviative
OCP	Obligatory Contour Principle
OC.	Oceania
OPl	plural object
OPT	optative
OT	Optimality Theory
PA	Preposed Article
PAR	paradigmatic
PASS	passive
PAST	past tense
PAUC	paucal
P(ER)	person
PD	patient deleted (Anywa)
PERF	perfective
PL	plural

p	plural
PN	person+number
PREF	prefix
PRET	preterite tense (Fula), preterite mode (Menominee)
PROGR	progressive aspect
PRS	present tense
REL	relative
RPast	Relative Past (Fula)
S	subject
s	singular
S.	South(ern)
SAgr	subject agreement
SAP	Speech Act Participant, i.e. non-third person
SDu	dual subject
SE.	South East
sep	separable
SG	singular
SPE	The Sound Pattern of English (Chomsky and Halle, 1968)
SPl	plural subject
SUFF	suffix
SYNT	syntagmatic

T(NS)	tense
TAM	tense-aspect-mood
TRI	trial
V	verb
VI	vocabulary item
W.	Western

Appendix B

Feature Names

+/-1	first person
+/-2	second person
+/-3	third person
+/-an	animate
+/-Acc	Accusative
+/-conj	conjunct order (Algonquian)
+/-def	definite
+/-du	dual
+/-hum	human
+/-ind	independent order (Algonquian)
+/-impf	imperfect(ive)
+/-la	‘there is a lower animate’

+/-lrs	low referential status (Menominee)
+/-nh	'there is no higher animate'
+/-Num	Number
+/-Nom	Nominative
+/-Obj	object
+/-obv	obviative
+/-Per	Person
+/-pl	plural
+/-ref	reflexive
+/-sg	singular
+/-spec	specific
+/-tns	tense
+/-V	verb

Appendix C

Georgian Verbal Paradigms

(1) Present Inflection: *xedav-s*, 'see' (Carmack, 1997:315)

		Object				
		1sg	**1pl**	**2sg**	**2pl**	**3**
	1sg			*g-vedav*	*g-xedav-t*	*v-xedav*
	1pl			*g-xedav-t*	*g-xedav-t*	*v-xedav-t*
Subject	**2sg**	*m-xedav*	*gv-xedav*			*xedav*
	2pl	*m-xedav-t*	*gv-xedav-t*			*xedav-t*
	3sg	*m-xedav-s*	*gv-xedav-s*	*g-xedav-s*	*g-xedav-t*	*xedav-s*
	3pl	*m-xedav-en*	*gv-xedav-en*	*g-xedav-en*	*g-xedav-en*	*xedav-en*

(2) Imperfect inflection: *xedav-a*, 'see' (Carmack, 1997:321)

Object

Subject	**1sg**	**1pl**	**2sg**	**2pl**	**3**
1sg			*g-vedavd-i*	*g-xedavd-i-t*	*v-xedavd-i*
1pl			*g-xedavd-i-t*	*g-xedavd-i-t*	*v-xedavd-i-t*
2sg	*m-xedavd-i*	*gv-xedavd-i*			*xedavd-i*
2pl	*m-xedavd-i-t*	*gv-xedavd-i-t*			*xedavd-i-t*
3sg	*m-xedavd-a*	*gv-xedavd-a*	*g-xedavd-a*	*g-xedavd-a-t*	*xedavd-a*
3pl	*m-xedavd-n-en*	*gv-xedavd-n-en*	*g-xedavd-n-en*	*g-xedavd-n-en*	*xedavd-n-en*

Appendix D

The Order of SubjectAgreement Affixes

This appendix contains all ordering patterns that were discussed in chapter 6. As “standard order I assume P > N, D > A and T > A. “+” marks the patterns that confirm to these orders, “-” those that are “reversed”. For the order of person and number affixes it is noted which features are involved. In D.1 and D.2 I note if the affixes are sep(arable) by other material or always expressed coherently. “synt” stands for patterns determined syntagmatically, and “par” for patterns determined paradigmatically.

D.1 Person and Number Affixes

Acoma	mixed	synt	P,N	sep	+
Ainu	mixed	par	PN,P	sep	+
Amharic	mixed	synt	P,N	sep	+
Amharic	mixed	par	PN,N	sep	+
Axininca	mixed	synt	P,N	sep	+
Basque	mixed	synt	P,N	sep	+
Beja	suff	synt	P,N	sep	+
Beja	mixed	synt	P,N	sep	+
Berber	mixed	par	P,N	sep	+
Berber	mixed	par	PN,N	sep	+
Cayuvava	pref	synt	P,N	coh	+
Chukchi	mixed	par	PN,N	sep	+
Didinga	suff	synt	P,N	coh	+
Dumi	suff	synt	PN,N	sep	+
Fur	mixed	synt	P,N	sep	+
Fur	mixed	par	PN,N	sep	+
Gahuku	mixed	synt	PN,N	coh	+
Georgian	mixed	synt	P,N	sep	+

Georgian	mixed	par	PN,P	sep	+
Hixkaryana	mixed	synt	P,N	sep	+
Huave	mixed	synt	P,N	sep	+
Huave	suff	synt	P,N	sep	+
Kanuri	suff	synt	P,N	coh	+
Kanuri	pref	synt	P,N	coh	+
Kalmyk	suff	synt	P,N	coh	+
Khanty	suff	synt	P,N	coh	+
Kilivila	mixed	synt	P,N	sep	+
Ket	mixed	synt	P,N	sep	+
Kiwai	mixed	synt	P,N	sep	+
Kiwai	pref	synt	P,N	sep	+
Lenakel	pref	synt	P,N	sep	+
Tama	mixed	synt	P,N	sep	+
Tama	suff	synt	P,N	sep	+
Mapudungu	suff	synt	P,N	coh	+
Maricopa	mixed	synt	P,N	sep	+
Maricopa	pref	synt	P,N	coh	+
Maung	pref	synt	P,N	coh	+
Mohawk	pref	synt	P,N	coh	+
Menominee	mixed	synt	PN,P	sep	+

Menominee	suff	synt	PN,P	sep	+
Muna	mixed	synt	P,N	sep	+
Muna	mixed	par	PN,N	sep	+
Nahuatl	mixed	synt	P,N	sep	+
Nenets	suff	synt	P,N	coh	+
Nunggubuyu	pref	synt	PN,N	coh	+
Nyangumarda	suff	synt	PN,N	coh	+
Nyangumarda	suff	synt	P,N	coh	+
Piro	mixed	synt	P,N	sep	+
QuechuaII	suff	synt	P,N	sep	+
Sanskrit	suff	synt	P,N	coh	+
Somali	suff	synt	P,N	sep	+
Somali	suff	par	PN,N	sep	+
Seri	mixed	par	PN,N	sep	+
Straits	suff	synt	P,N	coh	+
Teda	suff	synt	P,N	coh	+
Teda	mixed	synt	P,N	sep	+
Timucua	mixed	synt	P,N	sep	+
Timucua	mixed	par	PN,P	sep	+
Turkana	mixed	synt	P,N	sep	+
Turkana	mixed	par	PN,N	sep	+

Tzotzil	mixed	synt	P,N	sep	+
Tzotzil	mixed	synt	PN,P	sep	+
Ubykh	mixed	synt	P,N	sep	+
Udmurt	suff	synt	P,N	coh	+
Warlpiri	suff	synt	P,N	sep	+
Warlpiri	suff	par	PN,N	sep	+
Wardaman	pref	synt	P,N	coh	+
Winnebago	mixed	synt	P,N	sep	+
Yimas	mixed	synt	P,N	sep	+
Yurok	mixed	synt	PN,P	sep	+
Elamite	suff	synt	P,N	coh	-
Kanuri	mixed	par	PN,N	sep	-
Mekeo	pref	synt	P,N	coh	-
Nimboran	suff	synt	P,N	sep	-
Nimboran	suff	synt	PN,P	sep	-
Nimboran	suff	par	PN,N	sep	-
Nyangumarda	suff	synt	PN,N	coh	-
QuechuaI	suff	synt	P,N	sep	-
Teda	suff	synt	P,N	coh	-
Zapotec	suff	synt	P,N	sep	-

D.2 Direction Affixes and Subject Agreement

Menominee	suff	sep	+
Menominee	mixed	sep	-
Chukchi	mixed	sep	+
Chukchi	suff	coh	+
Turkana	pref	coh	+
Dumi	mixed	sep	+
Dumi	suff	sep	+
Mapudungun	suff	coh	+
Yurok	suff	sep	+
Yurok	mixed	sep	-
Nocte	suff	coh	+
Jyarong	suff	coh	+

D.3 Subject Agreement and Tense

Dyola	pref	+	PN
Nandi	pref	+	PN
Berber	pref	+	PN,P

Arabic	pref	+	PN,P
Kilivila	pref	+	P
Mohawk	pref	+	PN,P,N
Chinook	pref	+	PN
Huave	pref	+	P
Nahuatl	pref	+	PN,P
Chamorro	pref	+	PN
Akan	pref	-	PN
Swahili	pref	-	PN
Turkana	pref	-	PN,P
Anywa	pref	-	PN
Chukchi	pref	-	PN
Kiwai	pref	+	N
Kiwai	pref	-	P
Fula	suff	+	PN
Fur	suff	+	N
Marathi	suff	+	PN
Kalasala	suff	+	PN
Albanian	suff	+	PN
Portuguese	suff	+	PN
Lithuanian	suff	+	PN

German	suff	+	PN
Breton	suff	+	PN
Yukaghir	suff	+	PN
Mansi	suff	+	PN
Saamic	suff	+	PN
Chuvash	suff	+	PN
Yakut	suff	+	PN
Azerbajianian	suff	+	PN
Kalmyk	suff	+	PN,P,N
Evenki	suff	+	PN
Chukchi	suff	+	PN,N
Aleut	suff	+	PN
Inuktitut	suff	+	PN
Brahui	suff	+	PN
Tamil	suff	+	PN
Nimboran	suff	+	N
Nimboran	suff	-	P,PN
Nocte	suff	+	PN
Juang	suff	+	PN
Sora	suff	+	PN
Kobon	suff	+	PN

Western Desert	suff	+	PN
Quileute	suff	+	PN
Straits	suff	+	PN,P,N
Walapai	suff	+	P,N
Quechua	suff	-	N
Quechua	suff	+	PN,P,N
Jaqaru	suff	+	P
Piro	suff	+	PN,N
Macushi	suff	+	P,N
Shinasha	suff	+	PN
Menominee	suff	+	PN
Menominee	suff	-	P,PN
Nenets	suff	-	PN,P,N
Dumi	suff	+	N
Dumi	suff	-	PN
Choktaw	suff	-	PN
Kiwai	suff	+	P
Nahuatl	suff	+	N
Chukchi	mixed	+	PN,N
Huave	mixed	+	P,N
Anywa	mixed	+	PN

Dyola	mixed	+	PN
Menominee	mixed	-	P
Fula	mixed	-	PN
Ubykh	mixed	-	PN
Chukchi	mixed	-	PN
Dumi	mixed	-	PN
Juang	mixed	-	P
Kiwai	mixed	+	N,P
Kiwai	mixed	-	N
Yimas	mixed	-	PN
Maung	mixed	-	P,N
Wardaman	mixed	-	PN,P,N
Nungali	mixed	-	PN
Mohawk	mixed	-	PN,P,N
Chinook	mixed	-	PN
Choktaw	mixed	-	PN
Walapai	mixed	-	P
S.Tiwa	mixed	-	PN
Nahuatl	mixed	+	N
Nahuatl	mixed	-	PN,P
Urubu-Kaapor	mixed	-	PN

Apalai	mixed	-	P
Basque	pref	-	PN,P
Basque	mixed	+	N
Ket	pref	+	PN
Ket	suff	+	PN
Ket	suff	-	PN

Appendix E

The Language Survey

Acoma	Keresiouan	N.AMERICA	Miller (1965)
Ainu	Korean-Japanese	EURASIA	Shibatani (1990)
Akan	Kwa	AFRICA	Campbell (1991)
Albanian	Indoeuropean	EURASIA	Buchholz and Fiedler (1987)
Aleut	Eskimo-Aleut	EURASIA	Bergsland (1994)
Amharic	Semitic	AFRICA	Leslau (1995)
Anywa	Nilotic	AFRICA	Reh (1993)
Apalai	Carib	S.AMERICA	Koehn and Koehn (1986)
Arabic	Semitic	AFRICA	Ouhalla (1991)
Axininca Campa	Equatorial	S.AMERICA	Payne (1981)
Jaqaru	Aymaran	S.AMERICA	Hardman (2000)
Azerbajianian	S.Turkic	EURASIA	Schönig (1998)
Basque	Isolate	EURASIA	Arregi (1999)
Beja	Cushitic	AFRICA	Hudson (1976)

Berber	Berber	AFRICA	Noyer (1992)
Brahui	NW.Dravidian	EURASIA	Elfenbein (1998)
Breton	Celtic	EURASIA	Press (1986)
Cayuvava	Equatorial	S.AMERICA	Key (1967)
Chamorro	W.M.-Polynes.	SE.ASIA/OC.	Chung (1982)
Chinook	Penutian	N.AMERICA	Andersen (1977)
Choktaw	Penutian	N.AMERICA	Broadwell (2000)
Chukchi	Ch.-Kamchatkan	EURASIA	Krause (1976)
Chuvash	Bolgar	EURASIA	Johanson and Csató (1998)
Didinga	Saharan	AFRICA	Bryan and Tucker (1966)
Dumi	Tibetic	SE.ASIA/OC.	van Driem (1993)
Dyola	NW.Atlantic	AFRICA	Givón (1975)
Elamite	Elamo-Dravidian	EURASIA	Reiner (1969)
Evenki	Tungus	EURASIA	Nedyalkov (1994)
Fula	W.Atlantic	AFRICA	Arnott (1970)
Fur	Fur	AFRICA	Jakobi (1972)
Gahuku	Indo-Pacific	AUSTR./N.GUI.	Foley (1986)
Georgian	S.Caucasian	EURASIA	Carmack (1997)
German	Germanic	EURASIA	
Hixkaryana	Carib	S.AMERICA	Derbyshire (1979)
Huave	Penutian	N.AMERICA	Stairs and Hollenbach (1969)
Inuktitut	Eskimo	EURASIA	Mallon (1991)
Jacaltec	Otomanguean	N.AMERICA	Day (1973)
Juang	Austroasiatic	SE.ASIA/OC.	Mahapatra (1976)
Jyarong	Tibetic	SE.ASIA/OC.	DeLancey (1985)
Kalasala	Nuristani	EURASIA	Degener (1998)

Kalmyk	Mongolian	EURASIA	Campbell (1991)
Kanuri	Saharan	AFRICA	Cyffer (1992)
Ket	Isolate	EURASIA	Noyer (1992)
Khanty	Ugric	EURASIA	Abondolo (1998)
Kilivila	CE.M.-Polynes.	SE.ASIA/OC.	Senft (1986)
Kiwai	Trans-Fly	AUSTR./N.GUI.	Wurm (1975)
Kobon	Trans-NewGuinea	AUSTR./N.GUI.	Davies (1989)
Lenakel	CE.M-Polynes.	SE.ASIA/OC.	Tryon (1973)
Lithuanian	Balto-Slavic	EURASIA	Eckert et al. (1994)
Macushi	Carib	S.AMERICA	Abbott (1991)
Mansi	Ugric	EURASIA	Keresztes (1998)
Mapudungun	Andean	SE.ASIA/OC.	Grimes (1985)
Marathi	Indic	EURASIA	Pandharipande (1997)
Maricopa	Hokan	N.AMERICA	Gordon (1986)
Maung	Yiwaidjan	AUSTR./N.GUI.	Donohue (1998)
Mekeo	Mek	AUSTR./N.GUI.	Jones (1998)
Menominee	Algonquian	N.AMERICA	Bloomfield (1962)
Mohawk	Keresiouan	N.AMERICA	Bonvillain (1973)
Muna	W.M.-Polynes.	SE.ASIA/OC.	van den Berg (1989)
Nahuatl	Uto-Aztecan	NAMERICA	Andrews (1975)
Nandi	Nilotic	AFRICA	Creider and Creider (1989)
Nenets	Samoyed	EURASIA	Salminen (1998)
Nimboran	Nimboran	AUSTR./N.GUI.	Inkelas (1993)
Nocte	Tibetic	SE.ASIA/OC.	Gupta (1971)
Nungali	Djamindjungan	AUSTRIA	Hoddinott and Kofod (1976)
Nunggubuyu	Australian	AUSTR./N.GUI.	Heath (1984)

Nyangumarda	Pama-Nyungan	AUSTR./N.GUI.	Hoard and O'Grady (1976)
Piro	Equatorial	S.AMERICA	Matteson (1965)
Portuguese	Italic	EURASIA	Iliescu and Mourin (1991)
Quechua	Quechuan	S.AMERICA	Lakämper and Wunderlich (1998)
Quileute	Chimakuan	N.AMERICA	Andrade (1922)
Saamic	Finnic	EURASIA	Sammallahti (1998)
Sanskrit	Indic	EURASIA	Bucknell (1994)
Seri	Hokan	N.AMERICA	Marlett (1990)
Shinasha	Omotic	AFRICA	Rottland (1990)
Somali	Cushitic	AFRICA	El-Solami-Mewis (1987)
Sora	Austroasiatic	EURASIA	Baker (1985)
Straits	Salish	N.AMERICA	Jelinek and Demers (1994)
Swahili	Bantu	AFRICA	Vitale (1981)
Tama	Nilotic	AFRICA	Bryan and Tucker (1966)
Tamil	S.Dravidian	EURASIA	Annamalai and Steever (1998)
Teda	Saharan	AFRICA	Bryan and Tucker (1966)
Timucua	Paezan	S.AMERICA	Granberry (1993)
S.Tiwa	Tanoan	N.AMERICA	Rosen (1990)
Turkana	Nilotic	AFRICA	Dimmendaal (1983)
Tzotzil	Penutian	N.AMERICA	Aissen (1987)
Ubykh	N.Caucasian	EURASIA	Campbell (1991)
Udmurt	Finnic	EURASIA	Salminen (1998)
Urubu-Kaapor	Tupi-Guarani	S.AMERICA	Kakumasu (1991)
Walapai	Hokan	N.AMERICA	Redden (1966)
Wardaman	Gunwinyguan	AUSTR./N.GUI.	Merlan (1994)
Warlpiri	Pama-Nyungan	AUSTR./N.GUI.	Hale (1973)

Western Desert	Pama-Nyungan	AUSTR./N.GUI.	Noyer (1992)
Winnebago	Keresiouan	N.AMERICA	Greenberg (1988)
Yakut	N.Turkic	EURASIA	Stachowski and Menz (1998)
Yimas	Nor-Pondo	AUSTR./N.GUI.	Foley (1991)
Yukaghir	Uralic-Yukaghir	EURASIA	Campbell (1991)
Yurok	Ritwan	N.AMERICA	Robins (1958)
Zapotec	Otomanguean	N.AMERICA	Pickett (1955)

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