Coherence in Affix Order

Abstract

In this article, I propose a new family of constraints on affix order, called "COHERENCE", which require that index changes in morphological words are minimized. COHERENCE constraints complement the optimality-theoretic account of affix order for subject agreement affixes in Trommer (2003e) which relies crucially on alignment constraints, but cannot capture all attested ordering patterns. COHERENCE constraints have the effect that different affixes expressing features of the same syntactic head appear as close to each other as possible, but also allows to derive the restriction of verb agreement to one argument in many languages with rich inflection, in a line with Grimshaw (2001a,b) and Woolford (2003) who also argue that constraints on morpheme order have crucial effects on the cooccurrence of morphemes. Finally, I show that COHERENCE-based analyses of the discussed data are superior to approaches in terms of Generalized Alignment (McCarthy and Prince, 1993).

1. Introduction

Affixes which belong to each other should appear close to each other. But not all affixes actually obey this rule:[1]

(1)
a. *mïn-o-**d-ï*** — 'you (pl.) will go'
   go-FUT-**2-PL** — (Udmurt; Csúcs, 1998:290)
b. *dzi:-**k**-t-**i*** — 'we (pl:inc) speak'
   speak-**1**-NPAST-**PL:EXC** — (Dumi; van Driem, 1993:97)
c. ***v**-xedav-**t*** — 'we see'
   1-see-**PL** — (Georgian; Carmack, 1997:315)

[1]The following abbreviations are used in the glosses: 1/2/3 = first/second/third person, ABS = absolutive, ACC = accusative, ASP = aspect, COMPL = completive aspect, CONC = concurrent tense, D = direct/inverse marker, DU = dual number, ERG = ergative, E(XC) = (first person) exclusive, FUT = future, I(NC) = (first person) inclusive, MS = marked scenario marker, NPAST = non-past, NOM = nominative, NSG = non-singular, OBL = oblique case, PAST = past tense, PAUC = paucal, PERF = perfect tense, P(L) = plural, PRES = present tense, SG = singular, TNS = tense, TRI = trial number.

In all three examples, subject agreement is expressed by more than one affix (roughly one for person and one for number), but only in the Udmurt form (1a), both affixes occur string-adjacent. In the Dumi example (1b), they are separated by a tense suffix, and in the Georgian form (1c) by the verbal stem. In Trommer (2001, 2002b, 2003b,e), it is argued that the order of subject agreement affixes is determined by different rankings of universal alignment constraints on person and number, in competition with the constraint REFLECT which requires that the position of agreement affixes mirrors the position of its syntactic host. Since person agreement is aligned to the left edge and number agreement to the right edge of the morphological word, this accounts for many cases where number and person markers related to the same syntactic head are separated, such as in Georgian where person and number occur leftmost and rightmost respectively. What becomes problematic under this account are patterns where person and number are *not* maximally remote from each other and are either adjacent (as in Udmurt) or appear on the same side of the verb stem (as in Dumi).

In this paper, I propose to solve this problem by complementing alignment and REFLECT by a family of COHERENCE constraints minimizing index changes and thus requiring that affixes spelling out the same syntactic head should be adjacent to each other to different degrees. This allows affix ordering patterns which generally conform to the claim in Trommer (2003e) that person affixes precede number affixes but which cannot be captured in the original system. I show that COHERENCE constraints are preferable to ad-hoc ordering constraints of the Generalized-Alignment type (McCarthy and Prince, 1993), for conceptual and empirical reasons. Additional evidence for this new constraint type comes from the fact that COHERENCE constraints if ranked above relevant faithfulness constraints have the effect of restricting agreement in specific domains to one argument, a phenomenon which can be observed in many languages with rich agreement morphology.

At an intuitive level, COHERENCE should penalize configurations like (2b) (based on (1a)) in contrast to the one in (2a) since in (2b) two affixes corresponding to the same syntactic head are separated by an affix corresponding to a different head. Assuming that correspondence between syntactic heads and affixes is expressed by indices, the configuration problematic for COHERENCE would be schematically as in (2c):[2]

(2) **COHERENCE in Udmurt 2pl Form (1a)**

a. o:$[+\text{Fut}]_1$ d:$[+2]_2$ ï:$[+\text{pl}]_2$
b. d:$[+2]_2$ o:$[+\text{Fut}]_1$ ï:$[+\text{pl}]_2$
c. $[\ ]_i\ [\ ]_j\ [\ ]_i$, where $i \neq j$

[2]An alternative approach would be to identify affixes expressing the same head by the categorial features of the affixes themselves. However, affixes are sometimes underspecified for categories. Thus in many languages, subject and object agreement uses largely the same affixes (e.g. Wardaman, see below). It also occurs that morphological words contain more than one head of the same category (e.g. more than one tense head as in Nimboran and Lenakel, below). Indices obviate problems of this type and are independently motivated by their use in OT-faithfulness constraints (McCarthy and Prince, 1994, 1995).

COHERENCE as I propose it here, generalizes (2c) in two ways. First, it actually penalizes the simpler configuration in (3):

(3) $[\ ]_i\ [\ ]_j$, where $i \neq j$

Formalizing COHERENCE in this way simplifies computation of constraint violations, but maintains the preference for (2a) over (2b). (2a) matches (3) once by the pair o:$[+Fut]_1$ d:$[+2]_2$, but (2b) matches (3) twice by the pairs d:$[+2]_2$ o:$[+Fut]_1$ and o:$[+Fut]_1$ ï:$[+pl]_2$. In other words, (2a) violates COHERENCE once while (2b) violates it twice, which results in a preference for (2a). In addition, penalizing (3) predicts also that under specific conditions affixes belonging to different syntactic heads will be avoided even if they do not lead to discontinuity of affixes. That this prediction is indeed borne out will be shown in section 7.

The second generalization of COHERENCE I propose allows to restrict the constraint to specific domains, i.e., classes of morphemes. Thus I will assume that the COHERENCE constraint relevant for affix order in the Dumi example in (1b) repeated in (4a) is only sensitive to specific agreement markers and the verb stem, but not to tense markers. Hence the configuration visible to the constraint is actually (4b). Under this assumption, it follows that agreement affixes on the same side of the verb (4a) are preferred over forms where the verb occurs between agreement affixes (4c), since in (4b), (3) is matched only once (by dzi::$[+V]_1$-k:$[+1+pl]_2$), while it is matched twice in (4c) (by k:$[+1+pl]_2$-dzi::$[+V]_1$ and dzi::$[+V]_1$-i:$[+du]_2$):

(4) **COHERENCE in Dumi 1pe Form (1b)**

a. dzi::$[+V]_1$ -k:$[+1+pl]_2$-t:$[+past]_3$-i:$[+du]_2$
b. dzi::$[+V]_1$ -k:$[+1+pl]_2$ -i:$[+du]_2$
c. k:$[+1+pl]_2$-dzi::$[+V]_1$ -i:$[+du]_2$

The general format of COHERENCE constraints is defined in (5). VI ("Vocabulary Item") is a formal equivalent of the traditional notion "morpheme" (cf. section 2):

(5) **COHERENCE (D) :** Count a constraint violation for each VI V containing index i which is immediately preceded in domain D by another VI V' containing index j such that $i \neq j$.

Intuitively, constraint violations for COHERENCE can be computed by going one-by-one from left to right through all VIs of a domain, and counting a constraint violation for every 'index change', i.e. every VI which bears an index not present in the immediately preceding VI. Thus for (4b), one starts with dzi::$[+V]_1$ which does not incur a violation since it is the first VI of the domain, continues to -k:$[+1+pl]_2$ (one violation because its index is distinct from the index of the first VI) and finishes with -i:$[+du]_2$ which leads to no violation because it has the same index as -k:$[+1+pl]_2$).

I will discuss two instantiations of the constraint domain D: plain COHERENCE applies to the morphosyntactic word (accounting for data of the Udmurt type), while $\text{COHERENCE}_{[\text{-Case}]}$ is restricted to the part of this domain which is not related to case (accounting for the Dumi and similar data).

The remainder of this paper is organized as follows: In section 2, I introduce the theoretical framework I assume, and in section 3, I summarize the alignment-based account of affix order proposed in Trommer (2003e). In section 4, I discuss ordering patterns where person and number affixes exhibit the predicted order (Person $\succ$ Number), but occur always string-adjacent, which cannot be captured by the pure alignment/REFLECT system. To solve this problem, I introduce the family of COHERENCE constraints. In section 5, I show that COHERENCE extends to languages where person and number agreement is not necessarily string-adjacent, but always occurs on the same side of the verbal stem. In section 6 I discuss the resulting factorial typology for split agreement, and in section 7, I show that COHERENCE constraints also account for an apparently unrelated phenomenon, namely the restriction of specific agreement types to one argument in languages with hierarchy-driven subject/object agreement. I argue against the possibility of replacing COHERENCE by constraints of the Generalized Alignment type (McCarthy and Prince, 1993) in section 8. Section 9 contains a short summary of the paper.

2. The Framework: Distributed Optimality

The framework I will assume in this paper is Distributed Optimality (DO, Trommer, 2002c, 2003b), a postsyntactic approach to morphological spellout on the basis of Optimality Theory (OT, Prince and Smolensky, 1993). However, most of the arguments made here should carry over to any OT-based approach to spellout, where morphology has crucial access to syntactic structure (as e.g. in Noyer, 1993; Grimshaw, 1997, 2001b). DO shares with Distributed Morphology (DM, Halle and Marantz, 1993) the assumption that morphology is a separate module of the grammar interpreting the outputs of syntax, where the latter operates on abstract feature bundles (= heads = Lexical Items) without phonological content. Morphology assigns phonological content to syntactic structures by pairing word-like syntactic units (spell-out domains) with strings of vocabulary items (VIs) which combine (underspecified) morphosyntactic features with phonological content. Here is an illustrative example with the Georgian verb form *g-xedav-t*, 'I see you (pl.)' containing the second person object prefix *g-* and the general plural suffix *-t* (Carmack, 1997):

(6) **Syntax-Morphology Mapping for *g-xedav-t*** (1sg → 2pl, Georgian)

Input: $[+V]_1$ $[+Agr +Acc +2 +pl]_2$ $[+Agr +Nom +1 -pl]_3$

Output: g:$[+Acc+2]_2$ xedav:$[+V]_1$ t:$[+pl]_2$

The input consists of a list of abstract heads, the output of a list of VIs. Both representations are linked by coindexing according to the ideas of Correspondence Theory (McCarthy and Prince, 1994, 1995).[3] Note that not all underlying heads are necessarily expressed in the output ([+Agr +Nom +1 -pl] in (6) is not), and some can be expressed by more than one VI (such as [+Agr +Acc +2 +pl] in (6) which corresponds to g:[+Acc+2] and t:[+pl]).

Since the output of syntax serves in DO as the input to morphological computation, the grammar generates, as usual in OT, an infinite candidate set of output candidates which contains all strings which consist exclusively of VIs compatible with input heads.[4] Which heads are actually realized by VIs and the order of VIs in a given language depends on the language-specific ranking of universal constraints on markedness, faithfulness and morpheme order. In this paper I focus on ordering constraints. However, it will be shown that affix order constraints also have effects on the question whether a VI can appear in the output or not (see section 7).

3. Agreement, Alignment and REFLECT

Most accounts of affix order in verb inflection (e.g. Bybee, 1985; Noyer, 1992; Wunderlich, 1995; Baker, 1985) are based on the assumption that specific types of affixes (e.g. aspect) always occur closer to the verb stem than other types (e.g. tense), if both affixes are prefixes or both suffixes. Additionally Julien (2000) claims that the order of affix types is also fixed if one affix is a suffix and the other one a prefix, which she justifies by cross-linguistic evidence. For example, she observes that aspect affixes always follow tense markers in linear order, as long as tense is not a suffix, in which case the order is reversed:

(7) **Possible and impossible Affix Ordering Patterns for Tense and Aspect**

	both prefixes	Mixed	both suffixes
T > A	Tense Aspect Verb	Tense Verb Aspect	*Verb Tense Aspect
A > T	*Aspect Tense Verb	*Aspect Verb Tense	Verb Aspect Tense

In Trommer (2003e), I show on the basis of a crosslinguistic sample of 100 languages that the order of ”split” subject agreement, i.e. cases where subject agreement is split in different affixes marking person and number, follow a quite different pattern: The number marker always follows the person affix, regardless of their position with respect to the stem:

[3]Note however that not the VIs themselves are coindexed with lexical items, but the feature structures associated with VIs. Thus a portmanteau VI can contain two distinct feature structures with different indices. See Trommer (2003b) for more details. Trommer (2003b:ch. 4.2) discusses the differences in the basic constraint types of Standard Correspondence Theory and DO.

[4]See Trommer (2003b,f) for technical details.

(8) **Possible and impossible Affix Ordering Patterns for ”Split” SAgr**

	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 Trommer (2003e), I explain this pattern by the ranking of universal, violable constraints in the sense of Optimality Theory (Prince and Smolensky, 1993), which align person features to the right and number features to the left edge of spell-out domains (corresponding roughly to morphological words):

(9) a. L ⇦ PER (Align Person Agreement maximally to the left).
 b. NUM ⇨ R (Align Number Agreement maximally to the right)

From these constraints it follows that all else equal, person should follow number since positing person more rightwards than necessary leads to violations of L ⇦ PER and positioning number more leftwards to violations of NUM ⇨ R.

Apart from favoring orders where number follows person, this accounts for the fact that Person ≻ V ≻ Number is the overall favored pattern crosslinguistically and for the observation that number agreement in languages without person agreement is almost exclusively suffixal (see Trommer, 2003e). Finally, it lets expect that subject agreement, in most languages fusing person and number agreement, contrary to other affix types does not prefer suffixal or prefixal status (Hawkins and Gilligans, 1988:225), since ranking of the constraints in (9) is arbitrary and suffix/prefix position are preferred by one constraint each.

Apart from typological considerations, these constraint also allow to derive concrete affix ordering patterns in single languages.[5] (10) shows how these constraints lead to the derivation of the correct affix order of the Georgian verb form *v-xedav-t*, ‘we see’ (Carmack, 1997), where the 1st person subject marker *v-* precedes the verb while the number affix *-t* follows it:

(10) **Input:** $[+V]_1$ $[+1+pl]_2$ (1pl, Georgian)

		NUM ⇨ R	L ⇦ PER
☞	$v{:}[+1]_2$-$xedav_1$-$t{:}[+pl]_2$		
	$xedav_1$-$v{:}[+1]_2$-$t{:}[+pl]_2$		*!
	$xedav_1$-$t{:}[+pl]_2$-$v{:}[+1]_2$	*!	**
	$v{:}[+1]_2$-$t{:}[+pl]_2$-$xedav_1$	*!	

Constraint violations are marked by “*”. Constraint evaluation starts with the highest-ranked constraint (NUM ⇨ R), which eliminates all candidates where the number affix *t* is not at the right edge (*xedav-t-v* and *v-t-xedav*). Elimination of suboptimal candidates is depicted by “!”

[5]The language data in this section are discussed in more detail in Trommer (2003b,e) and are used here only for expository reasons.

after the responsible constraint violation. The second constraint, L ⇦ PER, eliminates now *xedav-v-t* (1 violation), since this is less harmonic than *v-xedav*-t which involves no violation at all. While the alignment constraints do not conflict in (10) this is what happens for affixes which express number and person at the same time such as Georgian 3pl *-en*:

(11) **Input:** $[+V]_1$ $[+3+pl]_2$ (3pl, Georgian)

		NUM ⇨ R	L ⇦ PER
	en:$[+3+pl]_2$-xedav:$[+V]_1$	*!	
☞	xedav:$[+V]_1$-en:$[+3+pl]_2$		*

A major claim of OT is that all constraints are universal and languages differ only by instantiating different rankings of these constraints. By reranking our alignment constraints we get a grammar that has the same order for split agreement as Georgian, but a different position for fused person/number affixes which occur always at the left edge. A case in point is Muna, a western Austronesian language spoken in Indonesia where the number affix *-amu* [+pl] follows the stem while the pure person markers (o:[+2 -1], no:[+3]) and the fused person-number marker do:[+3+pl] precede it (van den Berg, 1989:51):

(12) **Affix Order in Muna Person/Number Agreement**

o-kala	*o-kala-amu*	*no-kala*	*do-kala*
S2-go	S2-go-PL	S3-go	S3p-go
'you (sg.) go'	'you (pl.) go'	'he goes'	'they go'

(13) shows how the reversed ranking of L ⇦ PER and NUM ⇨ R derives the correct ordering for 3pl *do-kala*:

(13) **Input:** $[+V]_1$ $[+3+pl]_2$ (3pl, Muna)

		L ⇦ PER	NUM ⇨ R
☞	do:$[+3+pl]_2$-kala:$[+V]_1$		*
	kala:$[+V]_1$-do:$[+3+pl]_2$	*!	

A further factor which governs the position of agreement is the position of tense affixes. Thus in Island Kiwai, a Trans-New-Guinean language of the Kiwaian branch spoken in Papua New Guinea (Wurm, 1975), in the present and past paradigms person markers are initial and number markers (here: dual) final, but in the future tenses, the dual marker is realized as a prefix following a prefixal tense marker:[6]

[6]See Trommer (2003e) for crosslinguistic evidence that SAgr is usually attached to tense.

(14) **Subject Person and Number Agreement in Island Kiwai**

a. Present	**b. Definite Past**	**c. Indefinite Future**
n-V-duru-do	*n-V-ru-do*	*ni-du-do-V-ri*
1-V-TNS1-DU	1-V-TNS1-DU	1-TNS1-DU-V-TNS2

Under the assumption that subject agreement is attached syntactically to the higher tense head (Tense1) in Kiwai while the order of tense itself is derived syntactically as in Julien (2000), these patterns follow from the constraint REFLECT(AGR):

(15) **REFLECT(AGR):** An affix realizing an agreement category A should reflect the position of its host H by

a. being right-adjacent to an affix realizing H, or by

b. occupying the position of H, if H is not realized in its position

The following tableaus show how this derives the correct orders. In (16a) corresponding to (14a), do:[+du] satisfies NUM ➪ R since it is rightmost in the word form *and* REFLECT since it appears right-adjacent to *duru* which realizes the tense head (Tense1) to which agreement is adjoined in the syntactic representation (its host):

(16) **Input:** $[+V]_1$ $[+\text{Tense1}]_2$ $[+1\ +\text{du}]_3$ (Present 1du, Island Kiwai)

	L ⇦ PER	REFLECT	NUM ➪ R
☞ a. n:$[+1]_3$-V_1-duru_2-do:$[+\text{du}]_3$			
b. n:$[+1]_3$-do:$[+\text{du}]_3$-V_1-duru_2		*!	**
c. V_1-duru_2-n:$[+1]_3$-do:$[+\text{du}]_3$	*!*		
d. do:$[+\text{du}]_3$-V_1-duru_2-n:$[+1]_3$	*!**		***

In indefinite future forms (14c), Tense1 is a prefix (*du*) and so is do:[+du] which immediately follows the tense affix. Here number alignment and REFLECT are in crucial conflict: NUM ➪ R favors (17d) with word-final *do*, while higher-ranked REFLECT ensures that the dual suffix appears right-adjacent to the tense marker as in (17a):

(17) **Input:** $[+\text{Tense1}]_1$ $[+1\ +\text{du}]_2$ V_3 $[+\text{Tense2}]_4$ (Indef. Future 1du, Island Kiwai)

	L ⇦ PER	REFLECT	NUM ➪ R
☞ a. ni:$[+1]_2$-du_1-do:$[+\text{du}]_2$-V_3-ri_4			**
b. ni:$[+1]_2$-do:$[+\text{du}]_2$-du_1-V_3-ri_4		*!	***
c. du_1-ni:$[+1]_2$-do:$[+\text{du}]_2$-V_3-ri_4	*!		**
d. ni:$[+1]_2$-du_1-V_3-ri_4-do:$[+\text{du}]_2$		*!	

While the proposed alignment constraints and REFLECT account for a wide range of data, they do not capture the tendency that ”split” subject agreement markers often tend to occur close to each other. In the next section, I will discuss ordering patterns where person and number affixes exhibit the predicted relative order (Person ≻ Number), but occur always string-adjacent, which cannot be captured by the pure alignment/REFLECT system. To solve this problem, I introduce the family of COHERENCE constraints which turn out to have the desired effect.

4. String-Adjacent Agreement Clusters

In a number of Uralic languages, person and number affixes are clearly separable, but appear string-adjacent after tense marking. Thus in Udmurt, a Uralic language of the Permian branch spoken in the Russian republic of Udmurtia[7], (Csúcs, 1998:290), plural subject agreement is expressed consistently by the affix *-ï* after the person agreement affixes (*-m,-d,-z*), which are preceded by tense markers (*-o and i*):[8] (18) shows two basic paradigms for the verb *mïn*, 'to go':

(18) **Subject Person and Number Agreement in Udmurt**[9]

	Future		**Primary Past**	
	sg	**pl**	**sg**	**pl**
1	*mïn-o-(m)*	*mïn-o-m***(-ï)**	*mïn-i-(m)*	*mïn-i-m***(-ï)**
2	*mïn-o-d*	*mïn-o-d***-ï**	*mïn-i-d-m*	*mïn-i-d***-ï**
3	*mïn-o-z*	*mïn-o-z***-ï**	*mïn-i-z*	*mïn-i-z***-ï**

At first glance, it might seem that this pattern could be derived by the interaction of NUM ➪ R responsible for positioning the plural affix and REFLECT(AGR) responsible for positioning the person affixes, but this does not work since REFLECT and NUM ➪ R are satisfied equally well in (19a) and (19b), and prefixal person agreement fares better for L ⇦ PER (☛ shows the empirically correct candidate which does not win under the given constraint ranking, 'T' abbreviates the tense affix):

(19) **Input:** $[+V]_1$ $[+Tense]_2$ $[+2\ +pl]_3$ (2pl, Udmurt)

	REFLECT	NUM ➪ R	L ⇦ PER
☛ a. V_1-T_2-d:$[+2]_3$-ï:$[+pl]_3$			*!*
☞ b. d:[+2]-V_1-T_2-ï:$[+pl]_3$			
c. d:$[+2]_3$-ï:$[+pl]_3$-V_1-T_2	*!	*	
d. V_1-d:$[+2]_3$-T_2-ï:$[+pl]_3$			*!

Since (19b) has no constraint violations at all for any of the relevant constraints, this result is independent from the ranking: (19b) outranks (19a) under all possible constraint rankings.[10]

[7] Udmurt has nominative-accusative case marking, no object agreement, and relatively free word order with predominant SOV.

[8] The same pattern can be observed in Hungarian (Trommer, 2003d). Other verb paradigms in Udmurt differ only by using different tense/aspect/mood markers from the ones cited here.

[9] The final sound of 1sg forms is omitted optionally in dual and obligatorily in singular forms.

[10] In the terms of Prince and Smolensky (1993:129), (19a) is *harmonically bounded* by (19b). See section 6 for more discussion of this concept.

A similar problem arises with number agreement affixes which are contiguous with person/number agreement in prefixal position, as in Wardaman (Merlan, 1994:125), a non-Pama Nyungan language of the upper, inland Northern territory of Australia[11], where the non-singular marker *-rr* immediately follows prefixal person marking[12]. Note the complex distribution of person markers, and that 2nd person nonsingular is expressed by the fused person/number marker *nu-*:

(20) **Person and Number Subject Agreement in Wardaman**

	sg	**nsg**
1 excl.	*ŋa-*	*yi-**rr-***
1 incl.	*ŋa-yi*	*ŋa-**rr-***
2	*yi-*	*nu-*
3	*Ø/wu-*	*wu-**rr-***

(21) shows VIs for the single markers following roughly the analysis in Trommer (2006b):

(21) **VIs for Wardaman Intransitive Agreement**

a. nu : [+2 +pl]
b. ŋa : [+1]
c. wu : [+3] / [+pl]
d. yi : [–3]
e. rr : [+pl]

It is straightforward to derive the position of 2pl *nu-* by alignment, if L ⇦ PER outranks NUM ⇨ R and REFLECT (tense is consistently suffixal in Wardaman):

(22) **Input:** $[+V]_1$ $[+Tense]_2$ $[+2+pl]_3$ (2pl, Wardaman)

	L ⇦ PER	NUM ⇨ R	REFLECT
☞ a. nu:$[+2+pl]_3$-V_1-T_2		**	*
b. V_1-nu:$[+2+pl]_3$-T_2	*!	*	*
c. V_1-T_2-nu:$[+2+pl]_3$	*!*		

However for *wu-rr-*, the constraints let expect counter to fact that *rr-* which marks only number, should be word-final, because REFLECT and NUM ⇨ R favor this position. Since (23c) induces no constraint violations, this result is again independent of the concrete ranking:

[11] As many Australian languages, Wardaman has extremely free word order and a split-ergative system: Case marking in DPs and free pronouns follows an ergative-absolutive pattern, but agreement (see below) exhibits nominative-accusative alignment. Wardaman clauses obligatorily mark only a contrast between singular and non-singular (dual or plural), but allow optional suffixes for dual and plural on nouns, verbs, or (in the case of subject-verb agreement) both. I assume that these affixes are derivational, and will hence represent non-singular forms as [+pl].

[12] Similar patterns can be found in Kanuri (Cyffer, 1992) and Cayuvava (Key, 1967).

(23) **Input:** [+V]$_1$ [+Tense]$_2$ [+3+pl]$_3$ (3pl, Wardaman)

	L ⇦ PER	NUM ⇨ R	REFLECT
☛ a. wu:[+3]$_3$-rr:[+pl]$_3$-V$_1$-T$_2$		*!*	*
b. wu:[+3]$_3$-V$_1$-rr:[+pl]$_3$-T$_2$		*!	*
☞ c. wu:[+3]$_3$-V$_1$-T$_2$-rr:[+pl]$_3$			

While the Udmurt and Wardaman patterns cannot be derived with the assumed alignment constraints and REFLECT, they are still compatible with the claim that person agreement systematically precedes number agreement. This indicates that the alignment account should not be abandoned but complemented by a different constraint type. In fact, affix ordering in these cases can be captured straightforwardly if COHERENCE applying to the complete spellout domain is ranked above the other constraints. The tableau in (24) shows how high-ranked COHERENCE derives the correct affix order for the split agreement cases in Udmurt. Note that all candidates violate COH at least twice since the relevant VIs correspond to three different underlying heads[13]. Still, COHERENCE ranked above REFLECT and L ⇦ PER has the effect that candidates where split person-number markers are string-adjacent to each other (24a,b,c) are favored with respect to candidates where this is not the case (24d,e) since non-adjacency of the agreement markers induces an an additional 'index change' and hence one more COHERENCE violation. If REFLECT is ranked next, it favors forms where the emerging agreement cluster appears immediately after tense (this eliminates (24c)). Finally, NUM ⇨ R and L ⇦ PER ensure that person agreement is on the left of number agreement in the cluster (eliminating (24b)):

(24) **Input:** [+V]$_1$ [+Tense]$_2$ [+2 +pl]$_3$ (2pl, Udmurt)

	COH	REFLECT	NUM ⇨ R	L ⇦ PER
☞ a. V$_1$-T$_2$-d:[+2]$_3$-ï:[+pl]$_3$	**			**
b. V$_1$-T$_2$-ï:[+pl]$_3$-d:[+2]$_3$	**		*!	***
c. d:[+2]$_3$-ï:[+pl]$_3$-V$_1$-T$_2$	**	*!	**	
d. d:[+2]$_3$-V$_1$-T$_2$-ï:[+pl]$_3$	***!			
e. V$_1$-d:[+2]$_3$-T$_2$-ï:[+pl]$_3$	***!			*

In Wardaman, agreement is not adjacent to suffixal tense. Hence, REFLECT and NUM ⇨ R must be ranked below L ⇦ PER. Again, high-ranked COHERENCE excludes splitting of agreement (25c):

[13]The only way to further reduce the violations of COH would be to omit VIs. Effects of this type are discussed in section 7.

(25) **Input:** [+V]$_1$ [+Tense]$_2$ [+3+pl]$_3$ (3pl, Wardaman)

	COH	L ⇦ PER	NUM ⇨ R	REFLECT
☞ a. wu:[+3]$_3$-rr:[+pl]$_3$-V$_1$-T$_2$	**		**	*
b. wu:[+3]$_3$-V$_1$-rr:[+pl]$_3$-T$_2$	***!		*	*
c. wu:[+3]$_3$-V$_1$-T$_2$-rr:[+pl]$_3$	***!			

COHERENCE is also crucial for further ordering patterns in Wardaman. As discussed in Trommer (2003b), left-alignment of person in Wardaman is both more general and more specific than the data from intransitive verbs in (20) suggest. More general in the sense that it also extends to object marking which involves (largely) the same affixes as subject agreement. More specific in the sense that L ⇦ PER seems to be split into different subconstraints to establish linear order among subject and object affixes of different person. Descriptively all person agreement markers are ordered roughly according to the hierarchy 1 ≻ 2 ≻ 3, hence the order of affixes does not directly reflect argumental status, but only the person features of the arguments, and grammatical role is indicated by the position of the accusative marker *n-* (Merlan, 1994:126/127):[14]

(26) **Transitive Agreement in Wardaman**

a.	*ŋa-nu-n-* [+1]-[+2+pl]-ACC- 'I → you (nsg.)'	b.	*ŋa-n-nu-* [+1]-ACC-[+2+pl]- 'you (nsg.) → me'
c.	*ŋa- wu- n-* [+1]-[+3]-ACC- 'I → them'	d.	*ŋa-n-wu-rr-* [+1]-ACC-[+3]-[+pl] 'they → me (sg.)'
e.	*yi-wu-n-* [–3]-[+3]-ACC- 'you (sg.) → them'	f.	*yi-n-wu-rr-* [–3]-ACC-[+3]-[+pl]- 'they → you (sg.)'

In a line with L ⇦ PER, I assume constraints referring to the single person features L ⇦ [+1], L ⇦ [–3], L ⇦ [+2] and L ⇦ [+3] which are ranked in this order.[15] However the order of the accusative marker *n-* is not determined by the same features. *n-* occurs immediately after the person/number suffixes corresponding to the object (and hence makes the disambiguation of otherwise identical forms as in (26a,b) possible). Without a constraint in addition to person alignment, the wrong order for *n-* emerges in forms such as (26b) since L ⇦ [+1] and L ⇦ [+2] favor (27a) where both person affixes precede *n-* over the correct (27b):

[14]Note that number marking by distinct plural affixes is suppressed for objects in many transitive forms. Forms with overt affixes for object number are discussed below.

[15]This splitting up of L ⇦ PER also extends straightforwardly to intransitive forms. Hence in tableau (25) L ⇦ PER must replaced by L ⇦ [+1] ≫ L ⇦ [-3] ≫ L ⇦ [+2]. The subranking L ⇦ [+1] ≫ L ⇦ [-3] is also crucial to derive the order of person markers in the 1st person inclusive singular which involves two person prefixes (ŋa:[+1] and yi:[–3] in this order, cf. (20)).

(27) **Input:** $[+V]_1$ $[+Nom +2 +pl]_2$ $[+Acc +1 -pl]_3$ (2nsg → 1sg, Wardaman)

	L ⇦ [+1]	L ⇦ [-3]	L ⇦ [+2]	Num ⇨ R
☞ a. ŋa:$[+1]_3$-nu:$[+2+pl]_2$**-n:[+Acc]**-$_3$			*	*
☛ b. ŋa:$[+1]_3$**-n:[+Acc]**$_3$-nu:$[+2+pl]_2$			**!	
c. **n:[+Acc]**$_3$-ŋa:$[+1]_3$-nu:$[+2+pl]_2$	*!		**	

However, under the assumption of high-ranked Coh, the problematic candidate is ruled out since it involves splitting of two affixes coindexed with the same underlying head, and hence additional violations of Coh:

(28) **Input:** $[+V]_1$ $[+Nom +2 +pl]_2$ $[+Acc +1 -pl]_3$ (2nsg → 1sg, Wardaman)

	Coh	L ⇦ [+1]	L ⇦ [-3]	L ⇦ [+2]	Num ⇨ R
a. ŋa:$[+1]_3$-nu:$[+2+pl]_2$**-n:[+Acc]**-$_3$	**!			*	*
☞ b. ŋa:$[+1]_3$**-n:[+Acc]**$_3$-nu:$[+2+pl]_2$	*			*	
c. **n:[+Acc]**$_3$-ŋa:$[+1]_3$-nu:$[+2+pl]_2$	*	*!		**	

The rightmost position of *n-* becomes optimal if the rightmost person affix is coindexed with the object agreement head as in a 1sg → 2nsg form (26a):

(29) **Input:** $[+V]_1$ $[+Nom +1 -pl]_2$ $[+Acc +2 +pl]_3$ (1sg → 2nsg, Wardaman)

	Coh	L ⇦ [+1]	L ⇦ [-3]	L ⇦ [+2]	Num ⇨ R
☞ a. ŋa:$[+1]_2$-nu:$[+2+pl]_3$**-n:[+Acc]**-$_3$	*			*	*
b. ŋa:$[+1]_2$**-n:[+Acc]**$_3$-nu:$[+2+pl]_3$	*			**!	
c. **n:[+Acc]**$_3$-ŋa:$[+1]_2$-nu:$[+2+pl]_3$	**!	*		**	

Let us now turn to the full paradigm of transitive agreement in Wardaman (Merlan, 1994:126):

(30) **Wardaman Transitive Agreement**

Subject	**Object**			
	3sg	**3nsg**		
1sg exc	*ŋa-*	*ŋawun-*		
1nsg exc	*yirr-*	*yirrwun-*		
1sg inc	*ŋayi-*	*ŋayiwun-*		
1nsg inc	*ŋarr-*	*ŋarrwun-*		
2sg	*yi-*	*yiwun-*		
2nsg	*nu-*	*nuwun-*		
3sg	*Ø-*	*wuŋgun-*		
3nsg	*wurr-*	*wuŋgunburr-*		
	2sg	**2nsg**		
1sg exc	*ŋaŋ-*	*ŋanun-*		
1nsg exc	*yinun-*	*yinun-*		
3sg	*yimburr-*	*nuŋgun-*		
3nsg	*yimburr-*	*nuŋgunburr-*		
	1sg exc	**1nsg exc**	**1sg inc**	**1nsg inc**
2sg	*ŋani-*	*yingini-*		
2nsg	*ŋanu-*	*yuŋgunu-*		
3sg	*ŋan-*	*yingun-*	*ŋayingun-*	*ŋangun-*
3nsg	*ŋanburr-*	*yingunburr-*	*ŋayingunburr-*	*ŋangunburr-*

(31) shows a decomposition of the agreement complex into single VIs which abstracts away from morphophonological processes and follows closely the segmentation of (Merlan, 1994:127).[16] Which affixes crossreference subject and object is indicated by the subscripts *s* and *o*:

[16]In particular *w* turns into *b* after nasals, some instances of accusative *n-* assimilate in place to following velars and labials, and adjacent *n*s degeminate. In (30) I have corrected some obvious minor mistakes in Merlan's segmentation (she seems to have forgotten to separate *wu-* and *rr-* different times, has omitted a nasal in the segmentation of the 3nsg → 3nsg, and represented the accusative by surface *ŋ* instead of underlying *n* in 3 → 3nsg forms). The only substantial difference to Merlan's segmentation here is that Merlan assumes a decomposition of *gun-* into a number marker *gu-* and a second instance of the accusative prefix *n-*. Since *gu* never occurs without a following *n* and there is never a second instance of *n* without preceding *gu* this subsegmentation seems to me an unnecessary complication of the analysis without independent motivation.

(31) **Wardaman Transitive Agreement (Decomposed)**

Subject	**Object**			
	3sg	**3nsg**		
1sg exc	ŋa$_s$-	ŋa$_s$-wu$_o$-n$_o$-		
1nsg exc	yi$_s$-rr$_s$-	yi$_s$-rr$_s$-wu$_o$-n$_o$-		
1sg inc	ŋa$_s$-yi$_s$-	ŋa$_s$-yi$_s$-wu$_o$-n$_o$-		
1nsg inc	ŋa$_s$-rr$_s$-	ŋa$_s$-rr$_s$-wu$_o$-n$_o$-		
2sg	yi$_s$-	yi$_s$-wu$_o$-n$_o$-		
2nsg	nu$_s$-	nu$_s$-wu$_o$-n$_o$-		
3sg	Ø$_s$-	wu$_o$-n$_o$-gun$_o$-		
3nsg	wu$_s$-rr$_s$-	wu$_o$-n$_o$-gun$_o$-wu$_s$-rr$_s$-		
	2sg	**2nsg**		
1sg exc	ŋa$_s$-ŋ$_o$-	ŋa$_s$-nu$_o$-n$_o$-		
1nsg exc	yi$_s$-nu-n-	yi$_s$-nu$_o$-n$_o$-		
3sg	yi$_o$-n$_o$-wu$_s$-rr$_s$-	nu$_o$-n$_o$-gun$_o$-		
3nsg	yi$_o$-n$_o$-wu$_s$-rr$_s$-	nu$_o$-n$_o$-gun$_o$-wu$_s$-rr$_s$-		
	1sg exc	**1nsg exc**	**1sg inc**	**1nsg inc**
2sg	ŋa$_o$-n$_o$-ni$_s$-	yi$_o$-n$_o$-gun$_o$-ni$_s$-		
2nsg	ŋa$_o$-n$_o$-nu$_s$-	yi$_o$-n$_o$-gun$_o$-nu$_s$-		
3sg	ŋa$_o$-n$_o$-	yi$_o$-n$_o$-gun$_o$-	ŋa$_o$-yi$_o$-n$_o$-gun$_o$-	ŋa$_o$-n$_o$-gun$_o$-
3nsg	ŋa$_o$-n$_o$-wu$_s$-rr$_s$-	yi$_o$-n$_o$-gun$_o$-wu$_s$-rr$_s$-	ŋa$_o$-yi$_o$-n$_o$-gun$_o$-wu$_s$-rr$_s$-	ŋa-n-gun-wu$_s$-rr$_s$-

The forms with 3sg object are identical to the corresponding intransitive forms, and the affixes employed are mainly the same ones as in intransitive forms. The only additional markers are the object prefix *ŋ*-, which is restricted to the 1sg exc → 2sg form, the 2sg subject marker *ni*- which only occurs in forms with 1st person exclusive objects and a special marker for non-singular objects which can be represented as in (32) since it always occurs adjacent to accusative *n*-:

(32) gun : [+pl] / [+Acc]

Crucially, all forms in (31) conform strictly to COHERENCE since there is never intervention of affixes crossreferencing one argument between the markers crossreferencing the other argument. (33) shows the derivation for a 2nsg → 1nse form illustrating the fact that the assumed constraint ranking also captures the relative order of accusative *n*- and plural *gun*- ((33a) vs. (33b)) and the preference for word-initial *yi*- over *nu*- ((33a) vs. (33c)):

(33) **Input:** [+V]$_1$ [+Nom +2 +pl]$_2$ [+Acc +1 +pl]$_3$ (2nsg → 1nse, Wardaman)

	COH	L ⇦ [+1]	L ⇦ [-3]	L ⇦ [+2]	⇨ R NUM
☞ a. yi:[-3]$_3$-n:[+Acc]$_3$-gun:[+pl]$_3$-nu:[+2+pl]$_2$	*			***	*
b. yi:[-3]$_3$-gun:[+pl]$_3$-n:[+Acc]$_3$-nu:[+2+pl]$_2$	*			***	**!
c. nu:[+2+pl]$_2$-yi:[-3]$_3$-n:[+Acc]$_3$-gun:[+pl]$_3$	*		*!		***
d. yi:[-3]$_3$-nu:[+2+pl]$_2$-n:[+Acc]$_3$-gun:[+pl]$_3$	**!			*	**

Note finally that COHERENCE captures a crucial insight from derivational approaches to ”split” agreement (e.g. Noyer, 1992; Halle and Marantz, 1993; Trommer, 2003c), where the adjacency of affixes spelling out the same lexical head is the normal case, which can only be overridden by additional morphological factors such as affixal status of VIs or postsyntactic dislocation operations (Embick and Noyer, 2001). Contrary to these approaches, COHERENCE in the model I propose here is not overridden by rule-based stipulations, but by universal well-formedness conditions such as the alignment preferences for person and number agreement.

5. Stem-Uniform Agreement Clusters

What remains problematic for an alignment-based account of affix order are ordering patterns where person and number agreement affixes do not (necessarily) occur under string-adjacency, but appear consistently on the same side of the stem, i.e. both affixes are prefixal or both are suffixal. I call these patterns in the following ”stem-uniform agreement clusters”. If a prefixal tense marker appears ”sandwiched” between a word-leftmost person affix and a number affix immediately on the right of tense, this can be captured by a conspiracy of L ⇦ PER and REFLECT, such as in Island Kiwai (see section 3). In this section, I discuss two stem-uniform patterns which cannot be accounted for in this way, either because tense and agreement are suffixal, or because person agreement is not leftmost in the morphological word. Again, a constraint from the COHERENCE family proves essential for an empirically adequate account.

In Dumi, an almost extinct Kiranti language spoken in eastern Nepal (van Driem, 1993),[17] agreement occurs in three different positions. First, most number agreement and fused person/number agreement occurs after tense, i.e. the non-preterite marker *-t* in (34), (preterite tense is unmarked in Dumi). Note the difference between *-i* (dual, a high unrounded front vowel) and *-ɨ* (1st person dual exclusive, a high unrounded mid vowel):[18]

[17]Dumi is an ergative-absolutive language. While van Driem (1993) describes the inflectional morphology of Dumi in great detail, little is known on the syntax of the language. The analysis of Dumi here follows closely Trommer (2006a) which provides a virtually complete analysis of Dumi verb agreement.

[18]In the following, page numbers in examples without explicit reference to a source refer to the unique empirical reference for the respective language in the running text, e.g. van Driem (1993) for (34).

(34) **Dumi Agreement Affixes Following Tense**

a. *dzi:-t-**i*** 'we (du., inc.) speak/they(du.) speak' (p. 97)
speak-NPAST-DU

b. *dzi:-t-**ɨ*** 'we (du., excl.) speak' (p. 97)
speak-NPAST-1DU:EXC

Second there is split expression of person and number in 1st person plural forms, where 1st person marking is immediately after the verb stem and before tense[19], and number (plus additional person marking) again after tense:

(35) **Dumi Split Suffix Agreement**

a. *dzi:**-k**-t-**i*** 'we (plural, inc.) speak' (p. 97)
speak**-1**-NPAST**-PL:EXC**

b. *dzi:**-k**-t-**a*** 'we (plural, exc.) speak' (p. 97)
speak**-1**-NPAST**-[-du]**

Third, there are two agreement markers occurring in prefixal position: *ham-* which occurs only with 3pl intransitive subjects, and the portmanteau marker *a-*, which occurs in all forms, where the subject is not 1st person, and subject or object are not 3rd person (called the "marked scenario affix", MS in van Driem, 1993):

(36) **Dumi Prefix Agreement**

a. ***a-**phɨkh-ini* 'you (pl.) got up' (p. 97)
MS-get:up-[+2+pl]

b. ***ham-**dze:-t-a* 'they speak' (p. 97)
3PL-speak-NPAST-[-du]

Note that *ham-* and *a-* differ from the other agreement markers since they are specifying grammatical role or case. They occur only if their agreement features are linked in a specific way to subject and/or object, while agreement suffixes such as the dual marker *-i* can refer to subject and object:

[19] The only affix which can intervene between the verb root and *-k* is the reflexive marker *-nsi* (van Driem, 1993:125) which I take to be derivational and hence part of the verb stem. Between *-k* and tense a number of morphonologically conditioned "copies" of different morpheme types in other positions can occur. The role of this copy morphemes is still rather unclear. (cf.van Driem, 1993:121ff.)

(37) **Dumi Prefix Agreement**

a. *a-phɨkh-**i*** ‘you (du.) got up’ (p. 97)
MS-get:up-[+du]

b. *do:khos-t-**i*** ‘he sees them (du.)/they (du.) see him’ (p. 107)
see-NPAST-[+du]

(38) summarizes the positions of agreement affixes in Dumi. [+Hi] stands for the highest argument of the verb, i.e. the grammatical subject, and [–Erg] for non-ergative arguments (intransitive subjects and objects of intransitive clauses). Singular is analyzed as [-pl-du], dual as [-pl+du], and plural as [+pl-du]. See Trommer (2006a) for further details.

(38) **Positions of all Dumi Agreement Affixes**

I	**II**	**III**	**IV**
a:[-1+Hi][-3]			
ham:[-1-2+3+Hi-Erg+pl]			
	N/ŋ:[+1-pl]		
	k:[+1+pl]		
		u/R/ə:[-pl-du-2-3]	
		ɨ:[+1-2+du]	
		ɨ(portmanteau)	
			si/i:[+du]
			a:[-du]
			ini:[-1-du+pl]

Dumi affix alignment is determined mainly by the features [dual] and [1]: All markers in positions I and II specify [1], and all markers in positions III and IV specify dual. This follows from the constraints [DU] ⇨ R and L ⇦ [1] which align these features to the edges predicted by (9). How these constraints account for the affix order of an intransitive 2du form is shown in the tableau in (39):

(39) **Input:** $[+V]_1$ $[+Hi+2-1-pl+du]_2$ (2du, Dumi)

		[DU] ⇨ R	L ⇦ [1]
☞	a. a:$[-1+Hi]_2[-3]_2$ V_1 i:$[+du]_2$		
	b. a:$[-1+Hi]_2[-3]_2$ i:$[+du]_2$ V_1	*!	
	c. V_1 a:$[-1+Hi]_2[-3]_2$ i:$[+du]_2$		*!
	d. i:$[+du]_2$ V_1 a:$[-1+Hi]_2[-3]_2$	*!*	**

Position-III and position-IV affixes differ in a more subtle way. In both positions we find affixes which specify [dual] and [1]. The relevant difference is that number is dominant in affixes of position IV in the sense that they either contain exclusively number features (i:[+du], a:[-du]) or plus-valued (‘primary’) number features, but only minus-valued (“secondary”) person features. This intuition is implemented more formally in the definition of *primary number affixes* in (40):

(40) An agreement VI is a *primary number affix* if and only if:

a. it contains positive-valued number features
but no positive valued person features **or**

b. it contains a negative-valued number feature
but no person features

The number alignment constraint [NUM]$_{\text{PRIM}}$ ⇨ R aligns position-IV affixes to the right, but crucially targets only primary number affixes. This is shown for a 2pl → 1sg form in (41):

(41) **Input:** [+V]$_1$ [+Hi+2-1-3+pl-du]$_2$ [-Hi-2+1-3-pl-du]$_3$ (2pl → 1sg, Dumi)

	[NUM]$_{\text{PRIM}}$ ⇨ R	[DU] ⇨ R	L ⇦ [1]
☞ a. a:[-1+Hi]$_2$[-3]$_2$ V$_1$ ŋ:[+1-pl]$_3$ ə:[-pl-du-2-3]$_3$ ini:[-1-du+pl]$_2$		*	***
b. a:[-1+Hi]$_2$[-3]$_2$ V$_1$ ŋ:[+1-pl]$_3$ ini:[-1-du+pl]$_2$ ə:[-pl-du-2-3]$_3$	*!	*	**
c. a:[-1+Hi]$_2$[-3]$_2$ V$_1$ ini:[-1-du+pl]$_2$ ə:[-pl-du-2-3]$_3$ ŋ:[+1-pl]$_3$	*!*	**	***

The crucial point now is the fact that position-II affixes occur after, not before the stem, as predicted by the constraints introduced so far. This is illustrated in (42) for an intransitive 1pe form:

(42) **Input:** [+V]$_1$ [+Hi-2+1-3+pl-du]$_2$ (1pe, Dumi)

	[NUM]$_{\text{PRIM}}$ ⇨ R	[DU] ⇨ R	L ⇦ [1]
☛ a. V$_1$ k:[+1+pl]$_2$ a:[-du]$_2$			*!
☞ b. k:[+1+pl]$_2$ V$_1$ a:[-du]$_2$			

Assuming an additional alignment constraint such as [PL] ⇨ R outranking L ⇦ [1] (43) solves this problem, but leads to the incorrect prediction that ham:[-1-2+3+Hi-Erg+pl] in 3pl forms also appears after the stem (44):

(43) **Input:** [+V]$_1$ [+Hi-2+1-3+pl-du]$_2$ (1pe, Dumi)

	[NUM]$_{\text{PRIM}}$ ⇨ R	[DU] ⇨ R	[PL] ⇨ R	L ⇦ [1]
☞ a. V$_1$ k:[+1+pl]$_2$ a:[-du]$_2$			*	*
b. k:[+1+pl]$_2$ V$_1$ a:[-du]$_2$			**!	
c. V$_1$ a:[-du]$_2$ k:[+1+pl]$_2$		*!		*

(44) **Input:** [+V]$_1$ [+Hi-Erg-1-2+3+pl-du]$_2$ (3pl, Dumi)

	[NUM]$_{PRIM}$ ➪ R	[DU] ➪ R	[PL] ➪ R	L ⇦ [1]
☞ a. V$_1$ ham:[-1-2+3+Hi-Erg+pl]$_2$ a:[-du]$_2$			*	*
b. ham:[-1-2+3+Hi-Erg+pl]$_2$ V$_1$ a:[-du]$_2$			**!	
c. V$_1$ a:[-du]$_2$ ham:[-1-2+3+Hi-Erg+pl]$_2$	*!	*		**

The key to this problem seems to be that position-I affixes are marked for case features while position II affixes are not. Since all position-II affixes (as the position-I affixes) cooccur with other affixes indexing the same agreement head, the following generalization emerges:

(45) Caseless agreement affixes occur at the same side of the verbal stem

This observation can be captured by COH$_{[\text{-Case}]}$, i.e., COHERENCE restricted to the domain of VIs which are not case-related, where "case-related" is defined as in (46):

(46) A VI is case-related if and only if

a. its feature structure specifies at least one case feature (+/+Hi or +/-Erg) **or**

b. it corresponds to a case-assigning head (tense or little v)

k:[+1+pl] and a:[-du] are not case-related according to (46) since they do not specify case features (46a), and agreement heads never assign case (46b). VIs realizing verbal roots are generally not case-related since verbal roots neither assign nor are assigned case. For these reasons, in a verb form which contains k:[+1+pl] and a:[-du], these VIs and the VI corresponding to the verb will be part of the domain of COH$_{[\text{-Case}]}$ and induce at least one violation of this constraint since verb and agreement VIs correspond to different syntactic heads and have different adjacent indices – exactly the configuration penalized by the constraint. On the other hand, a form with agreement on both sides of the verb (k:[+1+pl]$_2$-V$_1$-a:[-du]$_2$) will incur one more violation of COH$_{[\text{-Case}]}$ than one where both are suffixes (V$_1$-k:[+1+pl]$_2$-a:[-du]$_2$) since it contains two instances of adjacent non-identical indices (k:[+1+pl]$_2$-V$_1$ and V$_1$-a:[-du]$_2$) while the latter order only contains one instance of this configuration (V$_1$-k:[+1+pl]$_2$).

If COH$_{[\text{-Case}]}$ is now crucially undominated by other constraints on affix order, we get the correct order for k:[+1+pl] and a:[-du], as shown in (47). [NUM]$_{PRIM}$ ➪ R excludes the possibility that both affixes are prefixes:[20]

[20]The only possibility to avoid violation of COH$_{[\text{-Case}]}$ completely is to suppress both affixes (or the verb). In section 7, I will show that COH$_{[\text{-Case}]}$ in Dumi indeed leads to suppression of agreement suffixes in specific contexts.

(47) **Input:** [+V]$_1$ [+Hi-2+1-3+pl-du]$_2$ (1pe, Dumi)

	COH$_{[\text{-CASE}]}$	[NUM]$_{\text{PRIM}}$ ⇨ R	[DU] ⇨ R	L ⇦ [1]
☞ a. V$_1$ k:[+1+pl]$_2$ a:[-du]$_2$	*			*
b. k:[+1+pl]$_2$ a:[-du]$_2$ V$_1$	*	*!	*	
c. k:[+1+pl]$_2$ V$_1$ a:[-du]$_2$	**!			

COH$_{[\text{-Case}]}$ is irrelevant for cases where agreement affixes specifying case features appear as prefixes because these are not in the domain of the constraint. Thus in the candidates in (48) COH$_{[\text{-Case}]}$ is only violated by the index change between V$_1$ and a:[-du]$_2$. ham:[-1-2+3+Hi-Erg+pl]$_2$ is case-related and hence not "visible" for COH$_{[\text{-Case}]}$:

(48) **Input:** [+V]$_1$ [+Hi-1-2+3+pl-du]$_2$ (3pl, Dumi)

	COH$_{[\text{-CASE}]}$	[NUM]$_{\text{PRIM}}$ ⇨ R	[DU] ⇨ R	L ⇦ [1]
a. V$_1$ ham:[-1-2+3+Hi-Erg+pl]$_2$ a:[-du]$_2$	*			*!
☞ b. ham:[-1-2+3+Hi-Erg+pl]$_2$ V$_1$ a:[-du]$_2$	*			
c. V$_1$ a:[-du]$_2$ ham:[-1-2+3+Hi-Erg+pl]$_2$	*	*!	*	**

Similarly, in non-past forms the VI corresponding to the tense marker *-t* will be irrelevant for COH$_{[\text{-Case}]}$ since it expresses tense, a case-assigning head, and is hence not case-related.

There are also languages where person and number affixes consistently precede the verbal stem and are in turn separated by affixes. Thus in Lenakel (Lynch, 1978), an Austronesian language spoken in the New Hebrides,[21] person (and person/number) markers and number affixes both appear in pre-stem position, intertwined with tense/aspect prefixes:[22]

(49) **Subject Person and Number Agreement in Lenakel**

a. *tɨ-**n**-ak-ia-kɨn* 'you (two) eat' (p. 43)
FUT-2-CONC-DU-eat

b. ***i**-ɨm-**ar**-ɨt* 'we (excl. plural) climbed' (p. 45)
1-PAST-PL-climb

c. ***k**-ɨm-**ia**-vɨn* 'we (inc. dual) went' (p. 45)
1INC-PAST-DU-go

I will assume that here – as in Southern Kiwai – agreement is attached syntactically to the higher tense head which is *tɨ-* in the future forms (49a) and otherwise zero (49b). However – in contrast to Kiwai – the ordering pattern cannot be derived by REFLECT and alignment since

[21]Lenakel has no overt case marking and distinguishes subject and object by SVO word order. Verb agreement is exclusively with the subject. The examples in (49) and (52) illustrate all person and number agreement affixes of Lenakel with the exception of different allomorphs and the anaphoric 3rd person marker *m-* which behaves with respect to affix order exactly like the other 3rd person agreement affixes in (46).

[22]Recall that in Southern Kiwai this order is restricted to certain tenses.

then the person markers should precede, not follow the highest tense head. Again, high-ranked COH$_{\text{[-Case]}}$ gives the required result, the tableau in (50) shows this for the form in (49a):[23] COH$_{\text{[-Case]}}$ rules out all candidates where n:[+2] and ia:[+du] are not on the same side of the stem (50e,f), REFL eliminates (50c,d), where no agreement marker is right-adjacent to the Tense1 affix, and finally (50a) wins over (50b) since it minimizes violations of NUM ➪ R:

(50) **Input:** $[[+\text{Tense1}]_1\ [+2\ +\text{du}]_2]\ [+\text{Tense2}]_3[+\text{V}]_4$ (Fut. 2du, Lenakel)

	COH$_{\text{[-CASE]}}$	REFL	NUM ➪ R	L ⇦ PER
☞ a. T_1-n:$[+2]_2$-T_3-ia:$[+du]_2$-V_4	*		*	*
b. n:$[+2]_2$-tɨ$_1$-ia:$[+du]_2$-T_3-V_4	*		**!	
c. T_1-T_3-V_4-n:$[+2]_2$-ia:$[+du]_2$	*	*!		***
d. T_1-T_3-V_4-n:$[+2]_2$-ia:$[+du]_2$	*	*!		***
e. T_1-n:$[+2]_2$-T_3-V_4-ia:$[+du]_2$	**!			*
f. n:$[+2]_2$-tɨ$_1$-T_3-V_4-ia:$[+du]_2$	**!	*		

Without COHERENCE, but otherwise the same ranking, we would get an order where person and number agreement appear on different sides of the stem (51e):

(51) **Input:** $[[+\text{Tense1}]_1\ [+2\ +\text{du}]_2]\ [+\text{Tense2}]_3[+\text{V}]_4$ (Fut. 2du, Lenakel)

	REFL	NUM ➪ R	L ⇦ PER
☛ a. T_1-n:$[+2]_2$-T_3-ia:$[+du]_2$-V_4		*!	*
b. n:$[+2]_2$-T_1-ia:$[+du]_2$-T_3-V_4		*!*	
c. T_1-T_3-V_4-n:$[+2]_2$-ia:$[+du]_2$	*!		***
d. T_1-T_3-V_4-n:$[+2]_2$-ia:$[+du]_2$	*!		***
☞ e. T_1-n:$[+2]_2$-T_3-V_4-ia:$[+du]_2$			*
f. n:$[+2]_2$-T_1-T_3-V_4-ia:$[+du]_2$	*!		

Without REFL being ranked higher than the alignment constraints, we would get a form where both agreement affixes are suffixal (50d), which would still satisfy COH$_{\text{[-Case]}}$. Note also that (50c) corresponds roughly to the prefixal pattern of Kiwai in (17) which has the opposite ranking of person and number alignment constraints.

The same constraint ranking also accounts for the order in the slightly more complex case of 3rd person agreement in Lenakel. While the differentiation between non-singular forms (dual, trial, plural) is expressed by prefixes after Tense$_2$ as in 1st/2nd person forms, the contrast between singular and non-singular is marked by different affixes in the person slot (*r-*,*k-*):

[23]Since Lenakel systematically lacks object agreement it is safe to conclude that its syntax does not contain a projection realizing object agreement. According to the principle that the number of features in VIs must be minimized when possible (Halle, 1997:130) it follows that agreement markers in the language do never specify case features which are not distinctive for agreement. Therefore all agreement affixes in Lenakel are subject to COHERENCE$_{\text{[-Case]}}$.

(52) **3rd-person Agreement in Lenakel**

a. ***r-***~~*ɨ*~~*m-arhap*~~*ɨ*~~*k* 'he asked' (p. 43)
3S-PAST-ask

b. ***k-ia-****ir* 'they (two) went' (p. 55)
3:NSG-DU-go

c. ***k-****ɨm-****hai-****alhaau* 'they (three) put down' (p. 57)
3:NSG-PAST-TRI-put

d. ***k-****n-****ai-****aliuok* 'they (many) went' (p. 57)
3:NSG-PERF-PL-walk

Thus the order is schematically Tense$_1$ Person/Number Tense$_2$ Number instead of Tense$_1$ Person Tense$_2$ Number as for non-third person agreement. (53) shows the derivation of the correct order for the form in (52d). While both, (53a) and (53b) fare equally well for the three highest-ranked constraints, here L ⇦ PER becomes decisive which favors (53a) with perfect left-alignment of [+3]:

(53) **Input:** [[+Tense1]$_1$ [+3 -sg +pl]$_2$] [+Tense2]$_3$[+V]$_4$ (Perf. 3pl, Lenakel)

	COH$_{[-CASE]}$	REFL	NUM ⇨ R	L ⇦ PER
☞ a. k:[+3-sg]$_2$-T$_3$-ai:[+pl]$_2$-V$_4$	*		***	
b. ai:[+pl]$_2$-T$_3$-k:[+3-sg]$_2$-V$_4$	*		***	*!*
c. T$_3$-V$_4$-k:[+3-sg]$_2$-ai:[+pl]$_2$	*	*!	*	***
d. k:[+3-sg]$_2$-T$_3$-V$_4$-ai:[+pl]$_2$	**!		***	

Again, COHERENCE adapts data which cannot be captured in the approach which is solely based on alignment and REFLECT, while preserving the insight that person appears left-most and number rightmost in a domain restricted by other constraints.

6 The Factorial Typology of Affix Order in Split Agreement

In this section, I show that the proposed constraint set only derives attested ordering patterns of split subject agreement. I will restrict myself to languages where subject agreement does not mark case, and tense is suffixal. The predictions for case-marked agreement are similar. Languages which have prefixal tense and split subject agreement are rare, and await more thorough empirical investigation.

(54) summarizes all conceivable affix orders for V, Per, Tense, and Num in languages with the syntactically derived order **V Tense** and split person number agreement which does not mark case.[24] The forms in the shaded cells are impossible under any ranking. (54a) corresponds to Wardaman, (54b) to Udmurt, (54d) to Georgian, and (54f) to Dumi:

[24]If Per and Num are marked for case, the possibilities are slightly more restricted, and (54f) is excluded.

(54) **Factorial Typology for Person and Number**

Per > Num		Num > Per	
a.	**Per Num** V Tense	a'.	**Num Per** V Tense
b.	V Tense **Per Num**	b'.	V Tense **Num Per**
c.	V **Per Num** Tense	c'.	V **Num Per** Tense
d.	**Per** V Tense **Num**	d'.	**Num** V Tense **Per**
e.	**Per** V **Num** Tense	e'.	**Num** V **Per** Tense
f.	V **Per** Tense **Num**	f'.	V **Num** Tense **Per**

I will show now that (54a,b,d,f) can be derived by the constraints PARSE F, L ⇦ PER, COH, REFL, and NUM ⇨ R, while all other orders are impossible. PARSE F is the most basic faithfulness constraint in DO. It assigns a constraint violation for each feature in a feature structure F of the input which is not realized by an output VI coindexed with F. Hence PARSE F enforces morphological realization of morphosyntactic features as long as this does not lead to violation of higher-ranked wellformedness constraints. The following four tableaus illustrate rankings which result in (54a,b,d,f) respectively (lower-ranked constraints are omitted where irrelevant):

(55) **Input:** V_1 $Tense_2$ $[Per\ Num]_3$ **(54a)**

	PARSE F	L ⇦ PER	COH	...
☞ a. $[Per]_3$ $[Num]_3$ V_1 $Tense_2$			**	
b. $[Per]_3$ V_1 $Tense_2$ $[Num]_3$			***!	
c. V_1 $[Per]_3$ $Tense_2$ $[Num]_3$		*!	***	
d. V_1 $Tense_2$ $[Per]_3$ $[Num]_3$		*!*	***	
e. V_1 $Tense_2$	*!*		*	

(56) **Input:** V_1 $Tense_2$ $[Per\ Num]_3$ **(54b)**

	PARSE F	COH	REFL	...
☞ a. V_1 $Tense_2$ $[Per]_3$ $[Num]_3$		**		
b. $[Per]_3$ $[Num]_3$ V_1 $Tense_2$		**	*!	
c. V_1 $[Per]_3$ $Tense_2$ $[Num]_3$		***!		
d. $[Per]_3$ V_1 $Tense_2$ $[Num]_3$		***!		
e. V_1 $Tense_2$	*!*	*	*	

(57) **Input:** V_1 Tense$_2$ [Per Num]$_3$ **(54d)**

	PARSE F	L ⇦ PER	NUM ⇨ R	. . .
☞ a. [Per]$_3$ V_1 Tense$_2$ [Num]$_3$				
b. [Per]$_3$ [Num]$_3$ V_1 Tense$_2$			*!*	
c. V_1 [Per]$_3$ Tense$_2$ [Num]$_3$		*!		
d. V_1 Tense$_2$ [Per]$_3$ [Num]$_3$		*!*		
e. V_1 Tense$_2$	*!*			

(58) **Input:** V_1 Tense$_2$ [Per Num]$_3$ **(54f)**

	PARSE F	REFL	COH$_{[\text{-CASE}]}$	L ⇦ PER	. . .
☞ a. V_1 [Per]$_3$ Tense$_2$ [Num]$_3$			*	*	
b. V_1 Tense$_2$ [Per]$_3$ [Num]$_3$			*	**!	
c. [Per]$_3$ V_1 Tense$_2$ [Num]$_3$			**!		
d. [Per]$_3$ [Num]$_3$ V_1 Tense$_2$		*!	*		
e. V_1 Tense$_2$	*!*				

Let us turn now to the orderings which are impossible. That a candidate C is impossible for a given constraint set S (i.e. can never become optimal under any ranking) in an optimality-theoretic grammar can be shown by providing a candidate C' which harmonically bounds it, i.e. is at least equally harmonic as C for all constraints in S, and more harmonic for at least one constraint (Prince and Smolensky, 1993:129). Thus (59a) (corresponding to (54d)) has the same number of constraint violations as (59b) (corresponding to (54e)) for L ⇦ PER, COH$_{[\text{-Case}]}$, and COH, and less violations for NUM ⇨ R and REFL, therefore (59b) is suboptimal under any ranking (indicated by "✝"):

(59) **Input:** V_1 Tense$_2$ [Per Num]$_3$ **(54e)**

	PARSE F	L ⇦ PER	COH$_{[\text{-CASE}]}$	COH	NUM ⇨ R	REFL
a. [Per]$_3$ V_1 Tense$_2$ [Num]$_3$			**	***		
✝ b. [Per]$_3$ V_1 [Num]$_3$ Tense$_2$			**	***	*	*

Similarly, all forms where number precedes person are harmonically bounded by forms where person and number affixes have the opposite order. This is shown in (60) for (54a') (corresponding to (60b)) which is harmonically bounded by (54a) (corresponding to (60a)):

(60) **Input:** V_1 $Tense_2$ $[Per\ Num]_3$ **(54a')**

	PARSE F	REFL	COH[-Case]	COH	L ⇦ PER	NUM ⇨ R
a. $[Per]_3$ V_1 $Tense_2$ $[Num]_3$			**	***		
☨ b. $[Num]_3$ V_1 $Tense_2$ $[Per]_3$			**	***	***	***

(54c) is not harmonically bounded by any single form, but as Samek-Lodovici and Prince (1999) show, a candidate z in a candidate set K can also be harmonically bounded by a bounding set B as defined in (61) (Samek-Lodovici and Prince, 1999:9):

(61) **Definition Bounding Set:** A set B⊆K is a bounding set B(z) for z ∈ K relative to a constraint set Σ, iff B has these properties:

a. **Strictness:** Every member of B is better than z on at least one constraint in Σ.

b. **Reciprocity:** If z is better than some member of B on a certain constraint C ∈ Σ some other member of B beats z on the constraint C.

(62) shows that (54a) (here (62b)) and (54b) (here (62c)) constitute such a bounding set for (54c) (here (62a)). "↑" indicates that the given candidate is better than (62a) for the respective constraint, and "↓" that it is worse:

(62) **Input:** V_1 $Tense_2$ $[Per\ Num]_3$ **(54e)**

	PARSE F	COH	COH[-Case]	L ⇦ PER	NUM ⇨ R	REFL
☨ a. $V_1[Per]_3$ $[Num]_3$ $Tense_2$				*	*	*
b. $[Per]_3$ $[Num]_3$ V_1 $Tense_2$				↑	**↓	*
c. V_1 $Tense_2$ $[Per]_3$ $[Num]_3$				**↓	↑	↑

Crucially, every member of the bounding set has at least one "↑" showing that Strictness holds, and for each ↓ there is a ↑ of the other candidate for the same constraint, hence Reciprocity also holds, and (62a) is ruled out.

7. COHERENCE and the One-Argument Restriction

All data I have discussed so far as evidence for the family of COHERENCE constraints concern aspects of affix order. In this section, I turn to a quite different phenomenon, the fact that languages restrict certain agreement types to maximally one argument, and show that this pattern can be derived by the COHERENCE constraints independently motivated by the affix order patterns discussed above. In section 7.1, I discuss languages where this restriction holds only for agreement markers unspecified for case, and in section 7.2, a language (Arizona Tewa) where it also extends to agreement specified for case. The restriction to one argument hence follows the same parametrization as affix order restrictions implemented by the the two constraints COHERENCE and $\text{COHERENCE}_{[\text{-Case}]}$.

7.1 One-Argument Restrictions for Caseless Affixes

As discussed in section 5, in Dumi basically the same affixes are used for agreement with subjects of intransitive and transitive clauses and with objects. Suffixal agreement is restricted to crossreferencing one argument. Which argument is targeted by agreement is largely due to the hierarchy 1st ≻2nd ≻3rd person. For example, the 1st person dual exclusive suffix *-ɨ* crossreferences the subject in (63a,b), but the object in (63c):

(63) **Subject and Object Agreement in Dumi**

a. *dzɨ:-t-**ɨ*** — 'we talk (du.,exc.)' (p. 130)
   talk-[+du+1-2]

b. *phɨkh-**ɨ*** — 'we (du.,exc,) wake him up' (p. 130)
   get:up-[+du+1-2]

c. *a-phɨkh-**ɨ*** — 'he wakes us (du.,exc,) up' (p. 130)
   MS-get:up-[+du+1-2]

Basically, the same is true for the non-1st person plural affix *-ini* in (64):

(64) **Subject and Object Agreement in Dumi**

a. *a-phɨkh-**ini*** — 'you (pl.) got up' (p. 97)
   MS-get:up-[+2+pl]

b. *a-du:khust-**ini (*-a)*** — 'you (pl.) saw him' (p. 108)
   MS-see-[+2+pl]

c. *a-du:khust-**ini (*-a)*** — 'he saw you (pl.)' (p. 108)
   MS-see-[+2+pl]

However, if one argument is 2pl and the other 1du exclusive, only marking for 1du occurs according to the hierarchy 1 ≻ 2:

(65) **Suppression of 2nd-Person Agreement in Dumi**

a. *phɨkh-**ɨ*** — 'we (du.,exc,) wake you (pl.) up' (p. 130)
   get:up-[+du+1-2]

b. *a-phɨkh-**ɨ*** — 'you (pl.) wake us (du.,exc,) up' (p. 130)
   MS-get:up-[+du+1-2]

I will be concerned here not with the formal representation of hierarchy effects, but only with the restriction of agreement to one argument. Trommer (2003a) gives a detailed account of the hierarchy effects in hierarchy-based competition (HBC) assuming a specific constraint type

BLOCK which suppresses the appearance of more than one agreement affix of a specified type. This is in line with other generative accounts of similar phenomena (e.g., Anderson, 1982; Halle and Marantz, 1993) who assume that agreement with more than one argument is blocked by specific mechanisms whose only motivation is to account for effects of this type. Here, I will show that this effect can be reduced to the independently motivated constraint type COHERENCE, namely if $\text{COH}_{[\text{-Case}]}$ is ranked above PARSE F, forms with two person affixes are ruled out. This is shown schematically in (66):

(66) **Input:** $[+\text{Nom} +2]_1$ $[+\text{Acc} +1]_2$ (2 → 1, Dumi)

	$\text{COH}_{[\text{-CASE}]}$	PARSE F
$[+1]_2$ $[+2]_1$	*!	**
☞ $[+1]_2$		***
☞ $[+2]_1$		***

Preference for 1st person agreement can then be implemented by a *Relativized* PARSE *constraint* such as PARSE [+1]/[+2] which states that the feature [+1] should be realized if it cooccurs in a local domain together with the feature [+2]:

(67) **Input:** $[+\text{Nom} +2]_1$ $[+\text{Acc} +1]_2$ (2 → 1, Dumi)

	$\text{COH}_{[\text{-CASE}]}$	PARSE [F]	PARSE [+1]/[+2]
$[+1]_2$ $[+2]_1$	*!	**	
☞ $[+1]_2$		***	
$[+2]_1$		***	*!

Since I will not be concerned here with hierarchy effects themselves, I will omit Relativized PARSE constraints from the following examples and focus on the restriction of agreement to one argument. See Trommer (2002a, 2003a,g) for more details on the formal formats and the empirical motivation for Relativized PARSE constraints.

The tableaus so far omit crucial morphemes. Considering also the verb stem, there is an apparent problem since $\text{COH}_{[\text{-Case}]}$ suppresses not only two agreement suffixes, but also a single one:

(68) **Input:** V_1 $[\text{-past}]_2[+\text{Nom} +2]_1$ $[+\text{Acc} +1]_4$ (NPast 2 → 1, Dumi)

	$\text{COH}_{[\text{-CASE}]}$	PARSE F
a. V_1 $[\text{-past}]_2$ $[+1]_3$ $[+2]_4$	*!*	**
b. V_1 $[\text{-past}]_2[+1]_3$	*!	***
c. V_1 $[\text{-past}]_2[+2]_4$	*!	***
☞ d. V_1 $[\text{-past}]_2$		***

But (68d) in contrast to all other candidates violates REFLECT: Since there are no agreement suffixes, no agreement VI reflects the position of tense. Since I have already shown in section

5 that REFLECT in Dumi is ranked above COH$_{\text{[-Case]}}$, this captures immediately the restriction to one argument:

(69) **Input:** V$_1$ [-past]$_2$[+Nom +2]$_1$ [+Acc +1]$_4$ (NPast 2 → 1, Dumi)

		REFLECT	COH$_{\text{[-CASE]}}$	PARSE F
	a. V$_1$ [-past]$_2$ [+1]$_3$ [+2]$_4$		**!	**
☞	b. V$_1$ [-past]$_2$[+1]$_3$		*	***
☞	c. V$_1$ [-past]$_2$[+2]$_4$		*	***
	d. V$_1$ [-past]$_2$	*!		***

In the tableaus so far I have not considered candidates where the verb is omitted to minimize COHERENCE violations. Thus a candidate such as (70) has no COH$_{\text{[-Case]}}$ violations at all.

(70) [-past]$_2$[+1]$_3$

I will assume that suppression of non-agreement affixes in favor of the realization of agreement is in principle excluded by specific constraints or general interpretability conditions (Trommer, 2002c).[25]

Cooccurrence of agreement affixes is permitted under two special circumstances. First if there are two affixes realizing the same argument, this does not lead to additional index changes and is therefore licit as e.g. in 1pl forms:

(71) **Input:** V$_1$ [-past]$_2$ [+Nom+1+pl-du]$_3$ (NPast 1pl, Dumi)

		REFLECT	COH$_{\text{[-CASE]}}$	PARSE F
☞	a. **V$_1$ k:[+1]$_3$**t:[-past]$_2$ **a:[-du]$_3$**		*	*
	b. **V$_1$** t:[-past]$_2$ **a:[-du]$_3$**		*	**!
	c. **V$_1$**t:[-past]$_2$ **k:[+1]$_3$**		*	**!
	c. **V$_1$ k:[+1]$_3$**t:[-past]$_2$	*!	*	**

Second, since COH$_{\text{[-Case]}}$ does not regard indices of agreement VIs which do specify case, the case-marked prefix *a-* can cooccur with agreement suffixes even though it bears a different index than the suffix:

(72) **Input:** V$_1$ [-past]$_2$ [+Nom+3-1-pl-du]$_3$ [+Acc+2-3-pl+du]$_4$ (3sg → 2du, Dumi)

		REFLECT	COH$_{\text{[-CASE]}}$	PARSE F
☞	a. a:[+Nom -1]$_3$[-3]$_4$**V$_1$** t:[-past]$_2$ **i:[+du]$_4$**		*	*
	b. **V$_1$** t:[-past]$_2$ **i:[+du]$_4$**		*	**!**
	c. a:[+Nom -1]$_3$[-3]$_4$**V$_1$** t:[-past]$_2$	*!	*	**

[25] A similar constraint seems to hold for affix order. Thus, in Trommer (2003e) it is argued that ordering restrictions on tense can override restrictions on agreement, but not vice versa.

Crucially, the one-argument restriction is sensitive to case marking in agreement affixes in exactly the same way as the requirement that agreement affixes appear on the same side of the stem. This is strong evidence that both phenomena are due to the same constraint.

To see that the affix-suppressing effect of $\text{COH}_{\text{[-Case]}}$ is not an idiosyncratic property of Dumi, I will now turn to a completely unrelated language which shows basically the same phenomenon. In Turkana (Dimmendaal, 1983), a Nilo-Saharan language spoken around Lake Turkana in Northern Kenya[26], the same agreement markers are used for subject and object agreement in person, but also in transitive forms only one person affix is allowed. This affix corresponds to the subject if the verb is intransitive (73a,b) or both arguments of a transitive clause are non-third person (73c), and otherwise to the argument which is higher on the hierarchy 1st/2nd ≻ 3rd person (73d,e):

(73) **Hierarchy-based Competition in Turkana**

a.	***à**-los-ì* 1sg-go-ASP	'I will go' (p. 121)
b.	***ɛ**-á-lós-í* 3-PAST-go-ASP	'she went' (p. 130)
c.	*k-à-ram-ì* [+Acc -3]-1_1-beat-ASP	'I will beat you (sg.)' (p. 122)
d.	***à**(*ɛ-)-mɪn-à* 1-(*3-)love-ASP	'I love her' (p. 69)
e.	*k-**à**-mɪn-à* [+Acc -3]-1-love-ASP	'she loves me' (p. 123)

The only exception to this generalization in person agreement is the marker *k-* (73c,e), which occurs with all 1st and 2nd person objects. Thus *k-* is the only person marker which is restricted to a specific grammatical role (namely object), but also the only person marker which can cooccur with other person affixes (e.g. with 1st person *à* in (73e)). While here, *k-* refers to the same argument as the person marker *à*, the reference of *k-* is different from the following person affix in (73c), where *k-* refers to the 2nd person object.

In addition to person marking, plural subjects are marked by plural suffixes. If it is the object that is realized by person agreement this leads to two arguments that are marked by agreement affixes:

(74) **3pl → 1sg Agreement in Turkana**

*k-à-ɪlam-e-**té*** 'they will bewitch me' (p. 123)
D-1_1-bewitch-ASP-PL_2

[26]Turkana is basically verb-initial with complex conditions on the relative ordering of S and O. Case marking follows a nominative-accusative pattern.

(75) summarizes the intransitive and transitive agreement patterns in Turkana:[27]

(75) **Turkana (In)transitive Agreement**

		Object		
		–/3	**1**	**2**
Subject	**1sg**	a-V	—	k-a-V
	2sg	i-V	k-i-V	—
	3sg	e-V	k-a-V	k-i-V
	1pl	ki-V	—	k-ki-V
	2pl	i-V-PL	k-i-V-PL	—
	3pl	e-V-PL	k-a-V-PL	k-i-V-PL

Just as in Dumi it is exactly the agreement affixes not marked for case which exclude each other. In contrast to Dumi, agreement is not right-adjacent to tense, but immediately to the left of tense markers (cf. (74b)). Hence REFLECT must be ranked relatively low and cannot license agreement. I will assume that in Turkana V has incorporated syntactically into little v, and the VIs for verb roots realize both heads, verbs are hence case-related according to the definition in (15), and do not induce violations of COH$_{[\text{-Case}]}$. (76) shows the derivation for the form in (73d), disregarding *k-*:

(76) **Input:** V$_1$ [+Nom+1-3]$_2$ [+Acc+3-1]$_3$ (1sg → 3sg, Turkana)

	COH$_{[\text{-CASE}]}$	PARSE F	REFLECT	PARSE [+1]/[+3]
a. ε:[+3]$_3$ a:[+1]$_2$ V$_1$	*!			
b. ε:[+3]$_3$ V$_1$		*		*!
☞ c. a:[+1]$_2$ V$_1$		*		

Adding an agreement marker specifying case such as object *k-* is again allowed and in fact obligatory, because it does not lead to violations of COHERENCE$_{[\text{-Case}]}$, but serves to realize additional features as required by PARSE F:

(77) **Input:** V$_1$ [+Nom+1-3]$_2$ [+Acc+3-1]$_3$ (1sg → 3sg, Turkana)

	COH$_{[\text{-CASE}]}$	PARSE F	REFLECT	PARSE [+1]/[+3]
☞ a. k:[+Acc -3]$_3$a:[+1]$_2$ V$_1$		*		
b. a:[+1]$_2$ V$_1$		**!*		
c. k:[+Acc -3]$_3$ ε:[+3]$_3$ V$_1$		*		*!
d. k:[+Acc -3]$_3$ a:[+1]$_2$ ε:[+3]$_3$ V$_1$	*!			

Now, we get the following factorial typology for languages with subject and object agreement where verb roots do not incorporate into little v. If COHERENCE$_{[\text{-Case}]}$ is undominated as in

[27] Turkana has a number of different plural allomorphs. Therefore no concrete marker is indicated in the table.

Turkana, we expect that agreement without case specifications is completely suppressed. This is shown schematically in (78):

(78) **Input:** V_1 $Tense_2$ Agr_3 Agr_4 (language without non case-related agreement)

	$\text{COH}_{[\text{-CASE}]}$	...
a. V_1 $Tense_2$ Agr_3 Agr_4	*!*	
a. V_1 $Tense_2$ Agr_1	*!	
a. V_1 $Tense_2$ Agr_2	*!	
☞ b. V_1 $Tense_2$		

Due to lexicon optimization (Prince and Smolensky, 1993), we expect that the lexicon of such a language has no agreement affixes which can be used both for subjects and objects since such affixes would necessarily be underspecified for case, and violate $\text{COHERENCE}_{[\text{-Case}]}$. An example of such a language is Kawenak Asmat, a dialect of Asmat from the Asmat-Kamoro family spoken in southwestern West Papua, for which Donohue (1999) gives the following affix inventories for subject and object agreement:[28]

(79) **Agreement Affixes in Kawenak Asmat**

	Subject	**Object**
1sg	-è	**-àn/-on/-en**
2sg	-èm	
3sg	–	-r/-i
1pl	-òm	-arou
2pl	-okòm	**-àn/-on/-en**
3pl	-ès	-r/-i

While Kawenak Asmat has interesting syncretisms (e.g. the 1sg/2sg/2pl object agreement markers fall together), subject and object markers are systematically different from each other, as predicted by (78).

If PARSE F is undominated (80) or ranked immediately under undominated REFLECT (81), agreement for all arguments is fully realized:

[28] Asmat is an SOV language with neutral alignment, i.e., without morphological case marking.

(80) **Input:** V_1 $Tense_2$ Agr_3 Agr_4 (Agreement for all arguments, ranking 1)

	PARSE F	. . .
☞ a. V_1 $Tense_2$ Agr_3 Agr_4		
a. V_1 $Tense_2$ Agr_1	*!	
a. V_1 $Tense_2$ Agr_2	*!	
b. V_1 $Tense_2$	*!*	

(81) **Input:** V_1 $Tense_2$ Agr_3 Agr_4 (Agreement for all arguments, ranking 2)

	REFL	PARSE F	. . .
☞ a. V_1 $Tense_2$ Agr_3 Agr_4			
a. V_1 $Tense_2$ Agr_1		*!	
a. V_1 $Tense_2$ Agr_2		*!	
b. V_1 $Tense_2$	*!	**	

This pattern is instantiated by any language which has free cooccurrence of standard subject and object agreement (e.g. Swahili; Ashton, 1989 and Fula; Arnott, 1970). Finally, if the ranking is REFLECT $\gg$ $\text{COH}_{[\text{-Case}]}$ $\gg$ . . ., we get the Dumi pattern as above:

(82) **Input:** V_1 $Tense_2$ Agr_3 Agr_4 (HBC for subject and object agreement)

	REFL	$\text{COH}_{[\text{-CASE}]}$	. . .
a. V_1 $Tense_2$ Agr_3 Agr_4		**!	
☞ a. V_1 $Tense_2$ Agr_1		*	
☞ a. V_1 $Tense_2$ Agr_2		*	
b. V_1 $Tense_2$	*!		

The factorial typology for languages with incorporation of v into V is similar. If PARSE F is undominated or ranked immediately below undominated REFLECT, full agreement with both arguments arises. Undominated $\text{COH}_{[\text{-Case}]}$ or $\text{COH}_{[\text{-Case}]}$ immediately below undominated REFLECT leads to the Turkana pattern with details of order governed by the ranking of REFLECT and the alignment constraints.

7.2 One-Argument Restrictions for All Affixes

Since unrestricted COHERENCE is formally completely parallel to $\text{COHERENCE}_{[\text{-Case}]}$ we expect that it can also derive one-argument effects. A possible example is Arizona Tewa (AT; Klaiman, 1993), a Kiowa-Tanoan language spoken in the eastern part of the Hopi Reservation in northeastern Arizona.[29] In AT, there are specific agreement markers for intransitive subjects, transitive subjects and transitive objects:[30]

(83) **Agreement Markers in Arizona Tewa**

	1sg	1du	1pl	2sg	2du	2pl	3sg	3du	3pl
Intransitive Subject	*'o-*	*ga-*	*gi-*	*'ų-*	*da-*	*'i-*	*na-*	*da-*	*di-*
Transitive Subject	*dó-*	*'án-*	*'í:-*	*'ná:-*	*den-*	*'obí:n-*	*mán-*	*den-*	*dí-*
Transitive Object		*di*		*wó:*	*wó:-bén*	*wó:-bé*	*'ó:*	*'ó:-bén*	*'ó:-bé*

Di- is used for 1st person objects of all number categories (singular, plural and dual).[31] The other object "affixes" consist of person affixes (*wo-:* 2nd person and *o:-:* 3rd person) and number affixes (*be-:* plural and *ben-:* dual) in the canonical order person ≻ number. I assume that the differences between these markers are due to the case specifications nominative (intransitive subjects), ergative (transitive subjects), and absolutive (transitive objects). As in other languages with HBC, agreement markers crossreferencing different arguments are disallowed. In transitive clauses agreement is with the argument which is higher on the person hierarchy 1 ≻2 ≻3 [32]. Thus in (84a), agreement is with the subject, but in (84b) with the object:

(84) **Hierarchy-based Competition in Arizona Tewa**

a. *Nɛ́'i kʷiyó dó-tay*
this woman 1SG-know
'I know this woman'

b. *Hę sen-di 'ų wó:-kʰɛ̨gen-'án*
that man-OBL you 2SG-help-COMPL
'That man helped you (sg.).'

That agreement in AT is restricted to one argument cannot follow from COHERENCE$_{\text{[-Case]}}$ since all agreement affixes are case marked, but it follows naturally from general COHERENCE under the assumption that the position of agreement mirrors a zero tense head due to high-ranked REFLECT.[33] The tableau in (85) shows how the form in (84a) is derived:

[29] AT does not have overt case marking on nouns except for an oblique affix (*-di* in (83b)) which marks the subject of clauses with object agreement. Clauses with object agreement are also peculiar in allowing free reordering of subject and object while word order is otherwise SOV (Klaiman, 1993:325).

[30] AT has different paradigms for predications with inanimate objects, ditransitives, and different mood categories not discussed here.

[31] Number differentiations in agreement are generally suppressed in AT transitive clauses if both arguments are non-third person. This is due to a universal constraint against number marking in such configurations (Noyer, 1992; Trommer, 2003g).

[32] The only exception are clauses with 1st person subject and 2nd person object where the verb has the portmanteau affix *wí-*. As in forms with 2nd person subjects and 1st person objects there is no number contrast in these forms.

[33] AT has overt aspect suffixes such as the compl(etive) marker in (84b), but no overt tense morphology.

(85) **Input:** [-past]$_1$ [+Erg+1-pl]$_2$ [+Abs+3-pl]$_3$ V$_4$ (1sg → 3sg, Arizona Tewa)

	Refl	Coh	Parse [+1]/[+3]	Parse F
a. V$_4$	*!		*	******
b. dó:[+Erg +1-pl]$_2$ ‘o:[+Abs+3]$_3$ V$_4$		**!		**
c. ‘o:[+Abs+3]$_3$ V$_4$		*	*!	*****
☞ d. dó:[+Erg +1-pl]$_2$ V$_4$		*		***

Independent evidence for the high ranking of Coherence and Reflect in this order comes from AT affix order. While subject agreement fuses person and number, object agreement allows straightforward segmentation in person and number suffixes which mirrors the pattern we have observed in Wardaman:

(86) **Input:** [-past]$_1$ V$_2$ [+Erg+3-pl]$_3$ [+Abs+2+pl]$_4$ (3sg → 2pl, Arizona Tewa)

	Refl	Coh	L ⇦ Per	Num ⇨ R
☞ a. wó::[+Abs +2]$_4$-bé:[+Abs +pl]$_4$ V$_1$		*		*
b. wó::[+Abs +2]$_4$-V$_1$ bé:[+Abs +pl]$_4$		**!		
c. V$_1$ wó::[+Abs +2]$_4$-bé:[+Abs +pl]$_4$	*!	*	*	

As Coherence$_{\text{[-Case]}}$, Coherence can also have more extreme effects, and suppress agreement altogether if it is ranked above Reflect and Parse F:

(87) **Input:** V$_1$ Agr$_2$ Agr$_2$ (language without agreement)

	Coherence	...
a. Agr$_1$ Agr$_2$V	*!*	
b. Agr$_1$ V	*!	
c. Agr$_2$ V	*!	
☞ d. V		

According to Lexicon Optimization such a language would not have agreement markers (and perhaps no representation of agreement heads in morphosyntax at all). Thus this ranking is instantiated by languages without agreement (e.g. Chinese).[34] If Parse F is undominated or ranked immediately below Reflect, we get languages which agree consistently with both arguments (e.g. Swahili).

[34] Coherence functions in this context similarly to the constraint *Structure which penalizes any morphosyntactic material (e.g. Aissen, 2003). However, in contrast to *Structure does not punish word forms consisting of single VIs or of different VIs all coindexed with the same syntactic head.

8. Generalized Alignment vs. COHERENCE

I assume here that morphological alignment constraints are highly restricted: they refer exclusively to word edges, and are bound by crosslinguistically observable tendencies (i.e., person alignment to the left, number alignment to the right edge). In the recent OT-literature, alignment is much less restricted, so that the edges of virtually every two constituents of a grammatical or phonological category (GCat and PCat) can be aligned according to the scheme for Generalized Alignment in (88) (McCarthy and Prince, 1993):[35]

(88) **Generalized Alignment**

Align (Cat1, Edge1, Cat2, Edge2) $=_{\text{def}}$
  ∀ Cat 1 ∃ Cat2 such that Edge1 of Cat1 and Edge2 of Cat2 coincide.
Where
  Cat1,Cat2 ∈ PCat ∪ GCat
  Edge1, Edge2 ∈ Right, Left

Technically, most phenomena I have analyzed in the last sections invoking COHERENCE could be captured by some form of Generalized Alignment (GA) constraints. In this section, I argue that an account in terms of COHERENCE constraints is nonetheless preferable both for the discussed affix ordering patterns (section 8.1) and the one-argument restrictions (section 8.2).

8.1 COHERENCE *vs. Alignment in Affix Order*

To see the similar role GA constraints and COHERENCE can play, recall from section 4 that an account in terms of general person/number agreement and REFLECT alone cannot correctly capture the order V-Tense- Agr_{Per}-Agr_{Num} as in Udmurt *mïn-o-d-ï*:

(89) **Input:** $[+V]_1$ $[+Tense]_2$ $[+2\ +pl]_3$ (2pl, Udmurt)

	REFLECT	NUM ⇨ R	L ⇦ PER
☛ a. V_1-T_2-d:$[+2]_3$-ï:$[+pl]_3$			*!*
☞ b. d:$[+2]_3$-V_1-T_2-ï:$[+pl]_3$			
c. d:$[+2]_3$-ï:$[+pl]_3$-V_1-T_2	*!	*	
d. V_1-d:$[+2]_3$-T_2-ï:$[+pl]_3$			*!

Instead of invoking COHERENCE, this could be accounted for by the Generalized Alignment constraint ALIGN(NUM, L, PER, R) which requires that the left edge of each number agreement affix should coincide with the right edge of a person agreement affix, hence number

[35] Since apart from infixation and similar patterns aligning the edges of affixes basically amounts to aligning the affixes themselves, the reference to edges does not imply any substantial restriction.

agreement should be right-adjacent to person agreement.[36]

(90) **Input:** $[+V]_1$ $[+Tense]_2$ $[+2\ +pl]_3$ (2pl, Udmurt)

	ALIGN(NUM, L, PER, R)	REFLECT	NUM ⇨ R	L ⇦ PER
☞ a. V_1-T_2-d:$[+2]_3$-ï:$[+pl]_3$				**
b. d:$[+2]_3$-V_1-T_2-ï:$[+pl]_3$	*!			
c. d:$[+2]_3$-ï:$[+pl]_3$-V_1-T_2		*!	*	
d. V_1-d:$[+2]_3$-T_2-ï:$[+pl]_3$	*!			*

While this constraint leads to the correct result, there are several problems the use of GA constraints faces: Note first that COHERENCE is preferable since it allows a more restrictive format of morphological alignment, referring exclusively to morphological word edges. Second, COHERENCE and simple edge alignment is formally simpler than Generalized Alignment. While edge alignment and COHERENCE can be captured by finite-state machines, Generalized Alignment has been shown to be much more complex computationally.[37] Third, also the descriptive content of COHERENCE is more minimalist than that of a GA constraint like in (90), which becomes clear from rough paraphrases of both constraints, as in (91): Both constraints require that agreement categories are adjacent, but ALIGN(NUM, L, PER, R) additionally requires that number is on the left of person.

(91) a. **ALIGN(NUM, L, PER, R):**
Agreement markers should be adjacent to each other, **and**
number agreement should be on the right of person agreement

b. **COHERENCE:**
(Agreement) markers should be adjacent to each other

According to Occam's, razor the theory making fewer stipulations should be preferred. Since COHERENCE involves a subset of the stipulations of the GA constraint, the analysis based on COHERENCE should be preferred.

The last argument points to a further shortcoming of the GA-based account: The fact that number agreement follows person agreement in Udmurt, which follows from the independently motivated alignment constraints in the COHERENCE-based account, must be stipulated directly in the GA constraint. In other words, the GA-account has to encode the strong tendency for the order Per $\ldots \succ \ldots$ Num twice, once by simple alignment and once by the GA constraint itself.

A special problem for a GA-account arises with the Wardaman data discussed in section 4. Recall that the accusative marker *n-* here always follows the agreement markers corresponding to the object:

[36]Basically the same result could be obtained by assuming ALIGN(PER,R, NUM, L). Which GA constraint is assumed does not affect the following arguments.

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

(92) **Case Coherence in Wardaman**

	COH	L ⇦ +1]	L ⇦ [+2]	**Input**
☞ a. ŋa$_1$-nu$_2$-**n**-$_2$	*		*	[+Nom +1 -pl]$_1$ [+Acc +2 +pl]$_2$
ŋa$_1$-**n**-$_2$-nu$_2$	*		**!	
☞ b. ŋa$_2$-**n**$_2$-nu$_1$	*		**	[+Nom +2 +pl]$_1$ [+Acc +1 -pl]$_2$
ŋa$_2$-nu$_1$-**n**-$_2$	**!		*	

An account in terms of GA would have to state that case must be right-aligned to the left edge of the nominative agreement marker, as in (93a):

(93) a. ALIGN([+Acc], L, [+Agr +Acc], R)
b. ALIGN([+Acc], L, [+Agr], R)

However, neither [+1] *ŋa-* nor [+1] *nu-* can be marked as accusative since they function as subject as well as object markers according to the context. Thus the only possible formulation of a relevant GA constraint is (93b) which does not refer to case at all. However, as can be seen in (94), ALIGN([+Acc], L, [+Agr], R) is never violated in any candidate where *n-* is non-final in the agreement cluster, which leads to consistent final position of *-n* since this minimizes the violations of L ⇦ [+2], which gives the wrong result for the input of (94b):

(94) **Case Coherence in Wardaman**

	Align	L ⇦ [+1]	L ⇦ [+2]	**Input**
☞ a. ŋa$_1$-nu$_2$-**n**-$_2$			*	[+Nom +1 -pl]$_1$ [+Acc +2 +pl]$_2$
ŋa$_1$-**n**-$_2$-nu$_2$			**!	
☛ b. ŋa$_2$-**n**$_2$-nu$_1$			**!	[+Nom +2 +pl]$_1$ [+Acc +1 -pl]$_2$
☞ ŋa$_2$-nu$_1$-**n**-$_2$			*	

What makes the Wardaman data problematic for a GA account is that GA constraints – as most constraints in OT - refer to output constituency and features, but not to indices. Thus COHERENCE seems to be just the right constraint type to capture phenomena like this which crucially refer to indices.

A final argument for the COHERENCE-based account of affix order is that it allows to generalize with the same constraint over rather different ordering patterns. Thus, Dumi requires – in addition to the position of at least one agreement marker right-adjacent to tense, a statement which fixes person agreement on the immediate right of the verb stem. This could be captured by the GA constraint (95a).[38] In Lenakel, the position of number agreement is left-adjacent to the verb which could be captured by (95b):

(95) a. ALIGN(PER, L,V,R)
b. ALIGN(NUM, R, V,L)

[38]Right-alignment of person to tense would be problematic since tense is not always overt.

These constraints have nothing more in common than their reference to the verb stem and to agreement. In the COHERENCE-based account proposed in section 5, both ordering facts follow from the single constraint $\text{COH}_{\text{[-Case]}}$. Similarly, the ordering of string-adjacent person and number and of person and case which is problematic for a GA-based account, follow both from COHERENCE. Thus, the use of COHERENCE leads to the overall reduction of constraints necessary to a general account of affix order.

8.2 Coherence vs. Alignment and One-Argument Restrictions

Woolford (2003) argues that effects in clitic clusters similar to the one-argument restrictions observed above can be derived by alternative means namely by alignment constraints.[39] Woolford assumes constraints such as (96):

(96) CL[$_{\text{V}}$ Align(clitic, Right; V,left)
The right edge of a clitic must be aligned with the left edge of the verb.

Based on this, she states (her constraint XRef corresponds in function here roughly to my PARSE [F]): "But besides placing and ordering clitics, clitic alignment constraints can also result in limiting the number of clitics allowed in a language. [If] the clitic alignment constraint is ranked above XRef, no clitic alignment violation is tolerated, even if that means not crossreferencing all of the arguments. The result is that the number of clitics is limited to one" (Woolford, 2003:12). The tableau in (97) shows schematically how this works technically:

(97) **Suppression of Multiple Clitics in Woolford (2003)**

		CL[$_{\text{V}}$	XREF	*CLITIC
	a. CL CL	*!		**
☞	b. CL		*	*
	c.		**!	

While alignment can have similar effects as COHERENCE, it is not a plausible candidate for the data discussed in this paper. A first problem is that the alignment approach leads not only to one-argument-restrictions but to one-affix restrictions. However, there are languages such as Dumi[40] where multiple agreement affixes are possible as long as they refer to the same argument:

(98) **Hierarchy-Based Competition in Dumi**

a. *phɨk-**k-a*** 'we (exc.) got up' (p. 97)
get:up-[+pl]-[-du]

b. ***ham-**dzeː-t-**a*** 'they speak' (p. 97)
3PL-speak-NPAST-[-du]

[39]See also Gerlach (1998) and Wunderlich (2000) for similar approaches.

[40]The same seems to be true for Ancash Quechua (see Lakämper and Wunderlich, 1998:119).

Even in languages where one-argument-restrictions have the effect of reducing agreement to one affix per word the use of alignment constraints is problematic, since alignment constraints need a fixed edge to refer to. To see this let us return to the Turkana data from (73) which are partially repeated here as (99):

(99) **Hierarchy-based Competition in Turkana**

a.	***ɛ****-á-lós-í* 3-PAST-go-ASP	‘**she** went’ (p. 130)
b.	***à-****(*ɛ-)-mɪ-à* 1-(*3-)love-ASP	‘**I** love her’ (p. 69)
c.	*k-****à-****mɪn-à* D-1-love-ASP	‘she loves **me**’ (p. 123)

Possible alignment constraints that could be stipulated under a Woolford-style analysis to account for the non-appearance of *ɛ-* in (99b) are Align(Person, Right; V, left) and Align(Person, Left; Word, left), which both would result in the correct order for (99b). However, there can intervene additional affixes for both edges: *k-* in (99c) and *á-* in (99a). If alignment is more important than realization of agreement, agreement should also be blocked in these cases counter to fact. The alignment account fails since there are no fixed edges to which alignment constraints could refer. A similar argument could be made for Menominee, where different competition domains with varying boundaries are found (cf. Trommer, 2003b:chapter 8).

Note finally that deriving one-argument restrictions by alignment requires in many cases (cf. the constraint in (96)) invoking the full inventory of Generalized Alignment which seems to be rather unrestricted (cf. section 8.1).

9. Summary

In this paper, I have argued for a new family of constraints on affix order. COHERENCE constraints penalize index changes in morphological words, and favor transparent affix ordering patterns which mirror the underlying syntactic structure. On the other hand, they lead to less complex output forms where affixes are suppressed in the context of affixes realizing different syntactic heads (‘one-argument restrictions’) or to the complete suppression of specific affix types in a given language. All these effects are attested in two varieties, one which targets all agreement affixes (due to general COHERENCE), and one which is restricted to those affixes unmarked for case (due to $\text{COHERENCE}_{[\text{-Case}]}$). The table in (100) summarizes the languages where the corresponding pattern can be observed:

(100) **Typology of COHERENCE Effects**

	COHERENCE	$\text{COHERENCE}_{\text{[-Case]}}$
Affix Coherence	Udmurt Wardaman	Dumi Lenakel
One-Argument Restrictions	Arizona Tewa	Dumi
Complete Suppression	Chinese	Kawenak Asmat

Thus COHERENCE constraints account for a wide range of apparently different phenomena, and – what is equally important – all types of effects following from these constraints are actually attested. In addition, I have shown that COHERENCE constraints provide a more adequate account of the relevant facts than constraints in terms of Generalized Alignment. This allows in turn substantial restrictions on the format of alignment constraints necessary to account for affix order and affix suppression in morphology.

References

Aissen, J. (2003). Differential object marking: Iconicity vs. economy. *Natural Language and Linguistic Theory*, 23(3):435–483.

Anderson, S. R. (1982). Where's morphology? *Linguistic Inquiry*, 13:571–612.

Arnott, D. W. (1970). *The Nominal and Verbal Systems of Fula*. Oxford: Clarendon Press.

Ashton, E. O. (1989). *Swahili grammar*. Harlow: Longman.

Baker, M. C. (1985). The mirror principle and morphosyntactic explanation. *Linguistic Inquiry*, 16:537–576.

Bybee, J. L. (1985). *Morphology*. Amsterdam: John Benjamins.

Carmack, S. (1997). Blocking in Georgian verb morphology. *Language*, 73(2):314–338.

Csúcs, S. (1998). Udmurt. In Abondolo, D., editor, *The Uralic Languages*, pages 276–304. London and New York: Routledge.

Cyffer, N. (1992). *We Learn Kanuri*. Köln: Köppe.

Dimmendaal, G. J. (1983). *The Turkana Language*. Dordrecht: Foris.

Donohue, M. (1999). Irregularity and pronominal markedness: Where favoritism sets in. *Oceanic Linguistics*, 38(2):409–420.

Eisner, J. (1997). FOOTFORM decomposed: Using primitive constraints in OT. In Bruening, B., editor, *Proceedings of SCIL VIII*, number 31 in MIT Working Papers in Linguistics, Cambridge, MA. MITWPL.

Embick, D. and Noyer, R. (2001). Movement operations after syntax. *Linguistic Inquiry*, 32(4):555–595.

Gerlach, B. (1998). Optimale Klitiksequenzen. Theorie des Lexikons, Arbeiten des Sonderforschungsbereichs 282, Nr. 103.

Grimshaw, J. (1997). The best clitic: Constraint conflict in morphosyntax. In Haegeman, L., editor, *Elements of Grammar: A Handbook in Contemporary Syntactic Theory*, pages 169–196. Dordrecht: Kluwer.

Grimshaw, J. (2001a). Economy of structure in OT. Ms. Rutgers University, available as ROA 434-0601.

Grimshaw, J. (2001b). Optimal clitic positions and the lexicon in Romance clitic systems. In Legendre, G., Grimshaw, J., and Vikner, S., editors, *Optimality-Theoretic Syntax*, pages 205–240. Cambridge MA: MIT Press.

Halle, M. (1997). Distributed Morphology: Impoverishment and fission. In Benjamin Bruening, Y. K. and McGinnis, M., editors, *Papers at the Interface*, volume 30 of *MIT Working Papers in Linguistics*, pages 425–449. Cambridge MA: MITWPL.

Halle, M. and Marantz, A. (1993). Distributed Morphology and the pieces of inflection. In Hale, K. and Keyser, S. J., editors, *The View from Building 20*, pages 111–176. Cambridge MA: MIT Press.

Hawkins, J. and Gilligans, G. (1988). Left-right asymmetries in morphological universals. In Hawkins, J. and Holmback, H., editors, *Papers in Universal Grammar*, pages 221–244. Lingua (special issue).

Heiberg, A. (1999). *Features in Optimality Theory: A Computational Model*. PhD thesis, University of Arizona.

Julien, M. (2000). *Syntactic Heads and Word-Formation: A Study of Verbal Inflection*. PhD thesis, University of Tromsø.

Key, H. H. (1967). *Morphology of Cayuvava*. The Hague: Mouton.

Klaiman, M. H. (1993). The relationship of inverse voice and head-marking in Arizona Tewa and other Tanoan languages. *Studies in Language*, 17:343–370.

Lakämper, R. and Wunderlich, D. (1998). Person marking in Quechua – a constraint-based minimalist analysis. *Lingua*, 105:113–148.

Lynch, J. (1978). *A grammar of Lenakel*, volume 55 of *Series B*. Pacific Linguistics B.

McCarthy, J. and Prince, A. (1993). Generalized alignment. *Yearbook of Morphology*, pages 79–153.

McCarthy, J. and Prince, A. (1994). The emergence of the unmarked: Optimality in prosodic morphology. In *NELS 24*, pages 333–379. Amherst.

McCarthy, J. and Prince, A. (1995). Faithfulness and reduplicative identity. *University of Massachusetts Occasional Papers in Linguistics*, pages 249–384.

Merlan, F. C. (1994). *A Grammar of Wardaman*. Berlin and New York: Mouton de Gruyter.

Noyer, R. R. (1992). *Features, Positions and Affixes in Autonomous Morphological Structure*. PhD thesis, MIT.

Noyer, R. R. (1993). Optimal words: towards a declarative theory of word formation. Ms. Princeton University, available under: http://www.ling.upenn.edu/˜rnoyer/papers.html.

Prince, A. and Smolensky, P. (1993). Optimality theory: Constraint interaction in generative grammar. Technical reports of the Rutgers University Center of Cognitive Science.

Samek-Lodovici, V. and Prince, A. (1999). Optima. Ms., ROA 363-1199.

Trommer, J. (1999). Mende tone patterns revisited: Tone mapping as local constraint evaluation. *Linguistics in Potsdam*, 5.

Trommer, J. (2001). A hybrid account of affix order. In Andronis, M., Ball, C., Elston, H., and Neuvel, S., editors, *CLS 37: The Panels. Papers from the 37th Meeting of the Chicago Linguistic Society*, pages 469–480. Chicago: Chicago Linguistic Society.

Trommer, J. (2002a). Hierarchy-based competition. Ms., available under http://www.uni-leipzig.de/ jtrommer/du.pdf.

Trommer, J. (2002b). The interaction of morphology and syntax in affix order. In DeCesaris, J., editor, *Proceedings of the 3rd Mediterranean Morphology Meeting, Barcelona, September 2001*.

Trommer, J. (2002c). Modularity in OT-morphosyntax. In Fanselow, G. and Féry, C., editors, *Resolving Conflicts in Grammar: Optimality Theory in Syntax, Morphology and Phonology*, pages 83–118. Hamburg: Helmut-Buske-Verlag. Special Issue 11 of Linguistische Berichte.

Trommer, J. (2003a). Direction marking as agreement. In Junghanns, U. and Szucsich, L., editors, *Syntactic Structures and Morphological Information*, pages 317–341. Berlin and New York: Mouton de Gruyter.

Trommer, J. (2003b). *Distributed Optimality*. PhD thesis, University of Potsdam.

Trommer, J. (2003c). Feature (non-)insertion in a minimalist approach to spellout. In *Proceedings of CLS 39*, pages 469–480.

Trommer, J. (2003d). Hungarian has no portmanteau agreement. In Siptár, P. and Pinón, C., editors, *Approaches to Hungarian*, volume 9, pages 283–302. Akadémiai Kiadó.

Trommer, J. (2003e). The interaction of morphology and syntax in affix order. In Booij, G. and van der Marle, J., editors, *Yearbook of Morphology 2002*, pages 283–324. Dordrecht: Kluwer.

Trommer, J. (2003f). An OT-based finite-state implementation of Menominee agreement morphology. Ms., University of Osnabrück.

Trommer, J. (2003g). Participant reduction and two-level markedness. In Spenader, J., Eriksson, A., and Dahl, O., editors, *Proceedings of the Workshop on Variation within Optimality Theory*, pages 101–108. available under http://www.ling.uni-osnabrueck.de/trommer/sh.pdf.

Trommer, J. (2006a). Hierarchy-based competition and emergence of two-argument agreement in Dumi. *Linguistics*, 44(5):1011–1057.

Trommer, J. (2006b). Plural insertion is constructed plural. In Müller, G. and Trommer, J., editors, *Subanalysis of Argument Encoding in Distributed Morphology*, volume 84 of *Linguistische Arbeits Berichte*, pages 197–228. Institut für Linguistik: Universität Leipzig.

van den Berg, R. (1989). *A Grammar of the Muna Language*. Dordrecht: Foris.

van Driem, G. (1993). *A Grammar of Dumi*. Berlin and New York: Mouton de Gruyter.

Woolford, E. (2003). Clitics and agreement in competition: Ergative cross-referencing patterns. In Carpenter, A. C., Coetzee, A. W., and de Lacy, P., editors, *Papers in Optimality Theory II*, volume 26 of *University of Massachusetts Occasional Papers*. Amherst: GLSA.

Wunderlich, D. (1995). Minimalist morphology: the role of paradigms. In Booij, G. and van Marle, J., editors, *Yearbook of Morphology 1995*, pages 93–114. Dordrecht: Kluwer.

Wunderlich, D. (2000). How gaps and substitutions can become optimal: the pronominal affix paradigms of Yimas. In Blevins, J. P., editor, *Transactions of the Philological Society, special issue on lexical paradigms*, pages 315–366. Oxford: Blackwell.

Wurm, S. A. (1975). The Trans-Fly stock. In Wurm, S. A., editor, *New Guinea Area Languages and Language Study: Papua Languages and the New Guinea Linguistic Scene*, volume 1 of *Pacific Linguistics, Series C,38*, pages 323–344. Canberra: Australian National University.