Harmonic Alignment and the Hierarchy of Pronouns in German

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1. Introduction

Different types of (personal) pronouns behave differently with respect to syntactic operations like Wackernagel movement, R-pronoun formation, coordination, and topicalization. This motivates the existence of pronoun classes. I assume that pronouns are ordered according to strength; the hierarchy that emerges for German is given in (1).

(1) *Personal Pronoun Scale*:

Pron_{strong}	$>\text{Pron}_{unstressed}>$	Pron_{weak}	$>\text{Pron}_{reduced}$	$(>\text{Pron}_{clitic})$
IHN[+stress]	ihn[+anim]	ihn[–anim]	es	('s)

The phonological feature [±stress] distinguishes between strong pronouns (which are capitalized here and henceforth) and others. The semantic feature [±animate] distinguishes between what I call unstressed pronouns and weak pronouns (cf. Cardinaletti & Starke (1996)). The phonological feature [±reduced] distinguishes between weak pronouns and reduced pronouns; the only reduced pronoun in Standard German is *es*. Finally, the phonological feature [±clitic] distinguishes between reduced pronouns and clitic pronouns. In contrast to what is the case with the other pronoun classes, the syntactic behaviour of clitic pronouns is mainly governed by phonological (rather than syntactic) constraints related to the distinction between pro- and enclisis, properties of potential clitic hosts, and so on (cf. Gärtner & Steinbach (2000), Zifonun (2000)). In what follows, I abstract away from this last class.

Table T_0 shows how the remaining four pronoun classes behave with respect to the four syntactic operations mentioned above. Interestingly, the pattern is not arbitrary, but obeys strict implicational generalizations: If a given pronoun undergoes Wackernagel movement, all weaker pronouns also undergo this operation; if a given pronoun undergoes R-pronoun formation (optionally or obligatorily), then all weaker pronouns do so as well; and if a given pronoun resists coordination and topicalization, all weaker pronouns share this property.

The main goal of this paper is to account for this pattern. The basic assumption is that for all four pronoun classes there is a constraint that forces a pronoun to show up in the Wackernagel position. All these Wackernagel constraints can in principle be

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T_0: Pronoun classes and syntactic operations

Pronouns	Wackernagel movement	R-pronoun formation	coordination	topicalization
strong	–	–	optional	optional
unstressed	obligatory	–	optional	optional
weak	obligatory	optional	–	–
reduced	obligatory	obligatory	–	–

violated; but the stronger a pronoun, the more likely the violability. Since this requires ranking and violability of constraints, I will develop the approach within optimality theory.[1] Furthermore, I will employ the optimality-theoretic mechanism of harmonic alignment in order to derive a fixed ranking among the four Wackernagel constraints on the basis of the pronominal hierarchy in (1). Variable behaviour with respect to the three remaining syntactic operations will then be shown to result from the way other constraints are interspersed among the Wackernagel constraints.[2]

I will proceed as follows. In section 2, I introduce the concept of harmonic alignment. In section 3, harmonic alignment is applied to the scale in (1), which accounts for the distribution of Wackernagel effects with pronouns in German. Based on this, sections 4, 5, and 6 address R-pronoun formation, coordination, and topicalization. A conclusion is drawn in section 7.

2. Harmonic Alignment

Prince & Smolensky (1993) develop harmonic alignment as a meta-principle that takes two indepedently motivated scales (hierarchies) as input and generates constraint hierarchies with a fixed internal order on this basis. The operation is defined in (2).

(2) *Harmonic Alignment* (Prince & Smolensky (1993, 136)):
Suppose given a binary dimension D_1 with a scale X > Y on its elements {X,Y}, and another dimension D_2 with a scale a > b > ... > z on its elements {a,b,...,z}. The *harmonic alignment* of D_1 and D_2 is the pair of harmony scales H_X, H_Y:
a. H_X: X/a $\succ$ X/b $\succ$ ... $\succ$ X/z
b. H_Y: Y/z $\succ$ ... $\succ$ Y/b $\succ$ Y/a
The *constraint alignment* is the pair of constraint hierarchies C_X, C_Y:
i. C_X: *X/z $\gg$ ... $\gg$ *X/b $\gg$ *X/a

[1] In what follows, knowledge of the basic concepts of optimality-theoretic syntax is presupposed; introductory texts include Legendre (2001) and Müller (2000b).

[2] Throughout this paper, I assume the clausal architecture developed in Chomsky (1995; 1998; 1999): CP is headed by C, which selects TP (with SpecT the canonical subject position); T selects vP (where v is a light verb and external arguments are base-generated in Specv); and v selects VP (which contains the main verb and internal arguments).

ii. C_Y: *Y/a $\gg$ *Y/b $\gg$ ... $\gg$ *Y/z

Thus, given two scales, one of them binary, two harmony scales are derived by harmonic alignment. The first harmony scale results from combining the first member of the binary scale with the members of the other scale from left to right. The second harmony scale is created by combining the second member of the binary scale with the members of the other scale, this time proceeding from right to left. In the (abstract) case at hand, the harmony scale H_X states that it is most harmonic for an X to be (more generally, to be associated with) an a, and least harmonic for an X to be a z; and H_Y implies that a Y is ideally a z, and the worst case is for a Y to be an a. The constraint hierarchies with their fixed internal order, C_X, C_Y, are then derived from the respective harmony scales H_X, H_Y by constraint alignment. Constraint alignment consists of reversing the order, replacing the symbol $\succ$ ("is more harmonic than") with the standard constraint ranking symbol $\gg$ ("is ranked higher than"), and prefixing each member of the harmony scale with a star * that tells us to avoid a given configuration. Accordingly, the fixed order in, e.g., the constraint hierarchy C_X implies that the ban on an X being a z is always highest-ranked, and that the ban on an X being an a is always lowest-ranked.

The empirical domain that Prince & Smolensky (1993) develop harmonic alignment for concerns syllable structure. The constraint H-Nuc ("Nuclear harmony constraint") requires syllables to have the most sonorous nucleus. This constraint differs from other optimality-theoretic constraints in that it is not local (i.e., in order to find out how well a candidate fulfills the constraint, it does not suffice to only consider the candidate itself), but rather translocal (the candidate must be compared with other candidates so as to find out which candidate has the most harmonic nucleus). Thus, evaluation of a candidate with respect to H-Nuc cannot consist of a simple yes/no decision (respected or violated); it requires an additional (albeit trivial) optimization procedure (much like transderivational constraints in some versions of the minimalist program). Prince & Smolensky (1993) note that this is theoretically unattractive and suggest deconstructing H-Nuc by deriving its effects by harmonic alignment on the basis of two simple scales, viz., the syllable position hierarchy in (3-a), and the sonority hierarchy in (3-b).

(3) a. *Syllable Position Prominence*:
P > M (Peak > Margin)
b. *Sonority Hierarchy*:
a > i > ... > t

Harmonic alignment creates two harmony scales. One of these, H_P, states that it is most harmonic for a syllable peak to be a low vowel, and least harmonic for a peak to be a voiceless alveolar stop.

(4) *Harmonic Alignment*:
a. H_P: P/a $\succ$ P/i $\succ$ ... $\succ$ P/t
b. H_M: M/t $\succ$ ... $\succ$ M/i $\succ$ M/a

Finally, constraint alignment produces two hierarchies with fixed order. C_P implies that the constraint blocking voiceless stops in the syllable peak always outranks the constraint blocking voiced stops in this position, that all constraints blocking consonants in this position outrank those blocking vowels, and that the lowest-ranked constraint is the one that blocks low vowels in the syllable peak.

(5) *Constraint Alignment*:
   a. C_P: *P/t $\gg$ ... $\gg$ *P/i $\gg$ *P/a
   b. C_M: *M/a $\gg$ *M/i $\gg$ ... $\gg$ *M/t

Given that every syllable must have some segment in its peak, it is clear that the C_P constraint hierarchy forces the choice of the most sonorous syllable peak in the optimal candidate, and thereby derives the effects of H-Nuc. Hence, given harmonic alignment, this translocal constraint can be dispensed with. In addition, the system is now more flexible because other constraints can be interspersed among the constraints of the syllable peak constraint hierarchy.

Harmonic alignment has been applied to syntax by Aissen (1999) and Artstein (1999). Among other things, these authors discuss the influence of a person scale (1./2. Pers. > 3. Pers.) on constraints that regulate the mapping from arguments to grammatical functions (Aissen), and on constraints that govern pro-drop (Artstein). In the next section, I show how harmonic alignment can account for Wackernagel movement in German.

3. Wackernagel Movement

3.1. Empirical Evidence for Wackernagel Movement

It has often been noted that certain types of pronouns must show up in a left-periphal ("Wackernagel") position following C in German.[3] In this position, the pronouns precede non-pronominal arguments (with one exception, see below) and adverbs of all types. The dividing line is between strong pronouns on the one hand, and unstressed, weak, and reduced pronouns on the other hand. As shown in (6-b), strong pronouns do not have to undergo Wackernagel movement. The question arises of whether they may undergo Wackernagel movement. (6-a) is fairly deviant, although perhaps not completely ill formed. I take this to mean that whereas Wackernagel movement is not an option with strong pronouns, these pronouns behave in many respects like non-pronominal NPs and can thus undergo scrambling (see below on the distinction). Under this view, (6-a) is deviant for the same reason that scrambling of stressed NPs generally is in German; see Lenerz (1977).

[3]See, e.g., Lenerz (1977; 1992), Thiersch (1978), Haftka (1981), Hoberg (1997), and Haider & Rosengren (1998).

(6) a.?*daß IHR$_1$ der Fritz gestern t_1 ein Buch geschenkt hat
that her$_{dat}$ ART Fritz$_{nom}$ yesterday a book$_{acc}$ given has
b. daß der Fritz gestern IHR$_1$ ein Buch geschenkt hat
that ART Fritz$_{nom}$ yesterday her$_{dat}$ a book$_{acc}$ given has

In contrast, other personal pronouns obligatorily undergo Wackernagel movement. This is shown for unstressed (animate) pronouns in (7), for weak (inanimate) pronouns in (8), and for reduced pronouns in (9).

(7) a. daß ihr$_1$ der Fritz gestern t_1 ein Buch geschenkt hat
that her$_{dat}$ ART Fritz$_{nom}$ yesterday a book$_{acc}$ given has
b. *daß der Fritz gestern ihr$_1$ ein Buch geschenkt hat
that ART Fritz$_{nom}$ yesterday her$_{dat}$ a book$_{acc}$ given has

(8) a. daß sie$_1$ der Fritz gestern der Maria t_1 geschenkt hat
that she$_{acc}$ ART Fritz$_{nom}$ yesterday ART Maria$_{dat}$ given has
b. *daß der Fritz gestern der Maria sie$_1$ geschenkt hat
that ART Fritz$_{nom}$ yesterday ART Maria$_{dat}$ she$_{acc}$ given has

(9) a. daß es$_1$ der Fritz gestern der Maria t_1 gegeben hat
that it$_{acc}$ ART Fritz$_{nom}$ yesterday ART Maria$_{dat}$ given has
b. *daß der Fritz gestern der Maria es$_1$ gegeben hat
that ART Fritz$_{nom}$ yesterday ART Maria$_{dat}$ it$_{acc}$ given has

There is one exception to the generalization that pronouns in Wackernagel positions must precede all clause-internal arguments. Subjects, and only subjects, may precede pronouns in Wackernagel positions clause-internally. Compare, e.g., (9-a) with (10-a) (where the subject NP precedes the reduced pronoun *es*) and (10-b) (where *es* is preceded by the indirect object NP).

(10) a. daß der Fritz es$_1$ t gestern der Maria t_1 gegeben hat
that ART Fritz$_{nom}$ it$_{acc}$ yesterday ART Maria$_{dat}$ given has
b. *daß der Maria es$_1$ der Fritz gestern t t_1 gegeben hat
that ART Maria$_{dat}$ it$_{acc}$ ART Fritz$_{nom}$ yesterday given has

I assume that the wellformedness of (10-a) alongside (9-a) is due to the fact that subject raising from the vP-internal base position to SpecT is optional in German (cf. Grewendorf (1989, ch. 3)), and that SpecT precedes the Wackernagel position.[4]

[4]As noted above, I assume that subjects are base-generated in a specifier of a light verb v that in turn embeds VP. – Note that the assumption of optional subject raising to to SpecT makes a unified approach to German Wackernagel movement and Scandinavian object shift possible (see Thráinsson (2001) for an overview). On this view, the two operations target the same position, the main structural difference being the optionality vs. obligatoriness of subject raising. Needless to say, though, a complete identification of the two operations ultimately demands an account of further (apparent) differences, concerning, e.g., the A- vs. A-bar nature of pronoun movement (thus, Wackernagel movement behaves like *wh*-movement with respect to the typical A-bar property of licensing parastic gaps, whereas object shift behaves like NP-raising in this respect), and the dependence on V movement (object shift can

However the optionality of subject raising is derived, it seems clear that the phenomenon in (10-a) is then independent of Wackernagel movement per se.

3.2. Analysis of Wackernagel Movement

One might take the evidence in (6)–(10) to suggest that unstressed, weak and reduced pronouns undergo Wackernagel movement to a specific functional projection that intervenes between TP and vP. Here, I will adopt a slightly different approach. On this view, Wackernagel movement of pronouns is formally indistinguishable from scrambling of non-pronominal NPs; both operations involve substitution in an outer specifier of vP (see Chomsky (1995; 1998; 1999) on multiple specifiers). The question then arises as to why Wackernagel pronouns must precede all other clause-internal material (except for subjects in SpecT). The answer is that the trigger for Wackernagel movement to Specv is different from the trigger for scrambling. I would like to suggest that Wackernagel movement is not feature-driven and targets a specific domain that is defined in both hierarchical and linear terms: the left edge of vP. In contrast, scrambling can be assumed to be triggered either by certain kinds of formal features (see Grewendorf & Sabel (1999) and Sauerland (1999), among others), or by linearization requirements that concern the relative order of items (e.g., [+def] precedes [–def], [+animate] precedes [–animate]), not any fixed position (like the left edge) (see, e.g., Choi (1999) and Büring (2001)).[5]

The analysis relies on harmonic alignment of the two scales in (11).

(11) a. *Position Scale*:
$\text{vP}_{i(nternal)} > \text{vP}_{e(xternal)}$

b. *Personal Pronoun Scale*:
$\text{Pron}_{s(trong)} > \text{Pron}_{u(nstressed)} > \text{Pron}_{w(eak)} > \text{Pron}_{r(educed)}$

The position scale is binary. It distinguishes between vP-internal positions and vP-external positions and thereby reflects a fundamental dichotomy in syntax: Given the predicate-internal subject hypothesis, vP is the minimal clausal domain containing the verb and its arguments; all higher clausal projections are functional. A crucial assumption now is that there is exactly one type of position that is dominated by a vP node but does not count as a vP-internal position, viz., the edge of vP, understood here as a left-peripheral specifier position of v:[6]

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only take place if the main verb has moved out of the vP, a restriction that does not seem to hold for Wackernagel movement.

[5]The fact that different triggers are involved can also be held responsible for certain asymmetries between Wackernagel movement and scrambling in the domain of remnant categories; see Müller (1998, ch. 5).

[6]This approach can straightforwardly be generalized from vP to the more general concept of "phase" in Chomsky (1998; 1999)); that approach also employs the notion of "edge." Note, however, that the notion of edge adopted here is closer to the notion of "phonological border" in Chomsky (1999), and

(12) *Edge of vP*:

a. A category α is at the edge of vP if (i) α is a specifier of v, and (ii) there is no β preceding α that is dominated by (a segment of) vP.

b. If vP dominates α, α is vP-external if it is at the edge of vP, and vP-internal otherwise.

The personal pronoun scale reflects the relative strength of pronouns and has already been discussed above (see (1)).[7] Harmonic alignment creates two harmony scales H_{vP_i}, H_{vP_e}. H_{vP_i} states that to show up vP-internally is more marked for reduced pronouns than for weak pronouns, more marked for weak pronouns than for unstressed pronouns, and more marked for unstressed pronouns than for strong pronouns; H_{vP_e} states the opposite for personal pronouns in vP-external positions.

(13) *Harmonic alignment*:

a. H_{vP_i}: $\mathrm{vP}_i/\mathrm{Pron}_s \succ \mathrm{vP}_i/\mathrm{Pron}_u \succ \mathrm{vP}_i/\mathrm{Pron}_w \succ \mathrm{vP}_i/\mathrm{Pron}_r$

b. H_{vP_e}: $\mathrm{vP}_e/\mathrm{Pron}_r \succ \mathrm{vP}_e/\mathrm{Pron}_w \succ \mathrm{vP}_e/\mathrm{Pron}_u \succ \mathrm{vP}_e/\mathrm{Pron}_s$

Finally, constraint alignment produces the constraint hierarchies in (14).

(14) *Constraint alignment*:

a. C_{vP_i}: $*\mathrm{vP}_i/\mathrm{Pron}_r \gg *\mathrm{vP}_i/\mathrm{Pron}_w \gg *\mathrm{vP}_i/\mathrm{Pron}_u \gg *\mathrm{vP}_i/\mathrm{Pron}_s$

b. C_{vP_e}: $*\mathrm{vP}_e/\mathrm{Pron}_s \gg *\mathrm{vP}_e/\mathrm{Pron}_u \gg *\mathrm{vP}_e/\mathrm{Pron}_w \gg *\mathrm{vP}_e/\mathrm{Pron}_r$

As in the account of Prince & Smolensky (1993), the analysis is based on one of the two constraint hierarchies thus derived: C_{vP_i}. Since the constraints of this hierarchy will turn out to act as triggers for Wackernagel movement, I will also refer to them as Wackernagel constraints.[8] The constraints of C_{vP_i} all take the form "Avoid a personal pronoun of a certain type in a vP-internal position" and thereby force personal pronouns to leave the vP-internal domain and show up somewhere else – either at the edge of vP, or in some other position. The weaker the pronoun is, the higher-ranked is the constraint that triggers displacement. The nature of this displacement operation must

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to the notion of "edge" in phonology, than to the notion of "edge" in Chomsky (1999).

[7] Do these simple scales directly reflect relative markedness, as is the case with the harmony scales below? This seems intuitively appealing, and at least for (a version of) (11-b), it has been proposed by Cardinaletti & Starke (1996). However, Müller, Tiedemann & Schmitz (2000) show that evidence from language acquisition does not support this hypothesis. Furthermore, as noted by a reviewer, it is by no means obvious from a theory-external point of view why the position scale should have to have the order in (11-a); e.g., the reverse order $\mathrm{vP}_e > \mathrm{vP}_i$ could be motivated on the basis of the canonical c-command relations in trees. Thus, I conclude that the scales in (11) are primiarily motivated on an empirical basis by data of the type discussed in the present paper; and I will leave open the issue of whether they can ultimately be justified externally.

[8] As for C_{vP_e}, for present purposes we can assume that the whole hierarchy is ranked low in German and therefore does not normally produce effects. That said, C_{vP_e} as a whole could actually take over most of the tasks of the economy constraint Last Resort that is introduced below – it blocks all instances of pronoun displacement except for those that are vP-internal.

be movement rather than base-generation if we assume that all personal pronouns are generated in a vP-internal position.[9]

The constraints in C_{vP_i} trigger Wackernagel movement of all kinds of pronouns; however, strong pronouns do in fact not undergo Wackernagel movement. Hence, there must be a conflicting constraint that prohibits such movement. In the approach adopted here, pronoun movement to the edge of vP differs from other, well-established instances of feature-driven movement (like, e.g., *wh*-movement). Wackernagel movement is triggered by a conspiracy of constraints, rather than by a regular feature. In Chomsky (1999), such repair-driven movement violates a ban on the assignment of EPP-features to v. I will assume here (following Heck & Müller (2000b)) that it violates the Last Resort constraint in (15) (see Chomsky (1995)).

(15) Last Resort (LR):
Movement must be feature-driven.

The ranking in German must then be (16):

(16) *Ranking in German*:
$*vP_i/Pron_r \gg *vP_i/Pron_w \gg *vP_i/Pron_u \gg LR \gg *vP_i/Pron_s$

Based on these assumptions, we can now derive that strong pronouns do not undergo Wackernagel movement in German, whereas unstressed, weak, and reduced pronouns do. For the time being, let us focus on the vP domain and ignore all higher structure (TP, CP, matrix clause). The ranking $LR \gg *vP_i/Pron_s$ ensures that with a strong pronoun in the input, the optimal output has the pronoun in the vP-internal domain; see tableau T_1, where output O_2 is optimal.

T_1: vP optimization: strong pronouns & Wackernagel movement

Input: IHR, ...	$*vP_i/Pron_r$	$*vP_i/Pron_w$	$*vP_i/Pron_u$	LR	$*vP_i/Pron_s$
O_1: [$_{vP}$ IHR$_1$ .. t_1 .. V]				*!	
☞O_2: [$_{vP}$ .. IHR$_1$ .. V]					*

In contrast, the rankings $*vP_i/Pron_u \gg LR$, $*vP_i/Pron_w \gg LR$, and $*vP_i/Pron_r \gg LR$ trigger Wackernagel movement of unstressed, weak, and reduced pronouns to the left edge of vP. This is shown for unstressed pronouns in tableau T_2.

With weak and reduced pronouns, the only difference to T_2 is that the in situ candidate O_2's fatal violation is one of $*vP_i/Pron_w$ or $*vP_i/Pron_r$.

At this point, an obvious question needs to be addressed: The constraints of the C_{vP_i} hierarchy force movement of pronouns out of the vP-internal domain, but they do

[9]This is generally presupposed; cf. the standard assumption that Θ-role assignment obeys strict locality (see Chomsky (1981)). In the present system, it can be derived from higher-ranked constraints that regulate the mapping from Θ-grids to grammatical functions and that require arguments of the verb to show up in a fixed hierarchical order within vP.

T_2: vP optimization: unstressed pronouns & Wackernagel movement

Input: ihr[+anim], ...	*vP$_i$/ Pron$_r$	*vP$_i$/ Pron$_w$	*vP$_i$/ Pron$_u$	LR	*vP$_i$/ Pron$_s$
☞O$_1$: [$_{vP}$ ihr$_1$ .. t$_1$ .. V]				*	
O$_2$: [$_{vP}$ .. ihr$_1$ .. V]			*!		

not explicitly force movement to the edge of vP. In principle, these constraints could also be fulfilled by moving the pronoun to some higher position, e.g., to a specifier position in the TP or CP domains. Given that Wackernagel movement can in fact not target these positions, this option must be excluded. To this end, I will adopt a version of the system of local optimization that is developed in Heck & Müller (2000ab). On this view, syntactic structure is created derivationally, by iterated applications of Merge and Move (cf. Chomsky (1995)). Each subpart of the derivation from one cyclic node to the next cyclic node is subject to input/output optimization. An optimal subderivation is one that respects all inviolable constraints (e.g., the Strict Cycle Condition), and that also best satisfies an ordered set of violable constraints. The optimal subderivation of one cycle then serves as the input for the next cycle, and so on, until the root is reached and the sentence is complete. The question arises as to what counts as a cyclic node. Following Chomsky (1995), Heck & Müller (2000ab) postulate that all XPs are cyclic. In contrast, I assume here that only phases in the sense of Chomsky (1998; 1999), i.e., vP and CP, count as cyclic nodes that are subject to optimization.[10] This is in line with Fanselow & Ćavar (2001).

The local optimization procedure that is relevant in the present context concerns vP. Given local optimization, it is clear why *vP$_i$/Pron can only be fulfilled by movement to the left edge of vP: At the stage of the derivation where vP optimization takes place, there is not yet any structure present above vP, and hence, no potential alternative landing site for Wackernagel movement. Of course, a subsequent optimization procedure (affecting CP) may require further pronoun movement (e.g., *wh*-movement; see below), but such an operation must then be triggered by a different constraint (most notably, a Feature Condition that demands checking of features by movement), and does not qualify as Wackernagel movement anymore: Once a *vP$_i$/Pron constraint is fulfilled by movement to the left edge of vP, any further pronoun movement that is not triggered by some other constraint or feature will fatally violate LR. Similarly, if LR blocks Wackernagel movement to the left edge of vP (as with strong pronouns), it will also block Wackernagel movement to other positions in subsequent cycles.

Note that, other things being equal, this result could not easily be obtained in a standard (global) optimization approach in which complete sentences are evaluated in one step (see Grimshaw (1997) and the vast majority of work in optimality-theoretic

[10] I do so mainly for expository purposes. Under the alternative definition of cyclic nodes, the approach to R-pronoun formation in section 4 below would have demanded a slightly more intricate version of the Strict Cycle Condition than is standard, viz., one that permits an operation to exclusively affect PP in the structure [$_{vP}$...[$_{PP}$...]...].

syntax). In such an approach, there would be no a priori reason why Wackernagel movement driven by *vP$_i$/Pron targets the left edge of vP, and not some other position higher up in the tree; consequently, additional constraints would be necessary to predict the correct outcome.

With Wackernagel movement now accounted for, I turn to R-pronoun formation.[11]

4. R-Pronoun Formation

4.1. Empirical Evidence for R-Pronoun Formation

Within German PPs, personal pronouns are sometimes replaced by R-pronouns with an adverbial origin ([–wh] *da* and [+wh] *wo*); whereas regular pronouns show up to the right of P, an R-pronoun attaches to the left of P in this construction.[12] This process of R-pronoun formation is impossible with strong pronouns and unstressed pronouns, optional with weak pronouns, and obligatory with reduced pronouns.[13] The ban on R-pronoun formation with strong and unstressed pronouns is illustrated in (17) and (18), respectively.

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[11]The question arises of how multiple Wackernagel movement as in (i-a) fits into the approach.

(i) a. daß es_1 ihr_2 der Fritz gestern t_1 t_2 gegeben hat
that it_{acc} her_{dat} ART $Fritz_{nom}$ yesterday given has

b. *daß ihr_2 der Fritz gestern es_1 t_2 gegeben hat
that her_{dat} ART $Fritz_{nom}$ yesterday it_{acc} given has

c. *daß ihr_2 es_1 der Fritz gestern t_1 t_2 gegeben hat
that her_{dat} it_{acc} ART $Fritz_{nom}$ yesterday given has

First, (i-b) shows that unstressed, weak, and reduced pronouns all have to move in multiple pronoun constructions. Strictly speaking, they cannot all show up at the left edge of vP, though. Still, *vP$_i$/Pron successfully triggers multiple Wackernagel movement if it is interpreted as gradient – the consequence then is that a pronoun moves as close to the edge as possible. Alternatively, (12-a) can be revised in such a way that pronouns as phonologically light items do not count as interveners: A category α is at the edge of vP if (i) α is a specifier of v, and (ii) there is no *non-pronoun* β preceding α that is dominated by (a segment of) vP. Second, (i-c) indicates that the pronouns show up in a fixed order in the Wackernagel domain. It may be that this phenomenon shows the activitiy of a low-ranked faithfulness constraint demanding order preservation that also derives superiority effects; see Williams (1999), Müller (2001). Alternatively, fixed pronoun order might follow from phonological linearization constraints concerning (a) pronoun length, and (b) quantity and quality of the onset, nucleus, and coda of the syllables that are involved; see Wegener (1985), Hoberg (1997), and Zifonun (2000).

[12]R-pronouns owe their name to the fact that an epenthetic *r* is inserted if the onset of the preposition starts with a vowel; compare *da-r-an* ("there-[r]-of") with *da-mit* ("there-[ ]-with").

[13]See Helbig (1974), van Riemsdijk (1978), Wunderlich (1984), van Riemsdijk & Williams (1986), Breindl (1989), Trissler (1993). Certain exceptions, intervening factors, and instances of synchronic and diachronic variation that blur this simple picture are addressed in Müller (2000a). The approach to R-pronoun formation to be developed below is a radical reworking of the analysis in that paper, which relies on a specific functional projection for Wackernagel pronouns and involves neither harmonic alignment nor local optimization.

(17) a. Ich habe gestern [PP mit IHR] telefoniert
I have yesterday with her phoned

b. *Ich habe gestern [PP da-mit] telefoniert
I have yesterday there$_{[+stress]}$-with phoned

(18) a. Ich habe gestern [PP mit ihr$_1$] telefoniert
I have yesterday with her phoned

b. *Ich habe gestern [PP da$_1$-mit] telefoniert
I have yesterday there$_{[+anim]}$-with phoned

(19) shows that R-pronoun formation is optional with weak pronouns. (The pronoun here stands for an inanimate feminine NP like *die Ausstellung* ("the exhibition").)

(19) a. Maria hat noch oft [PP an sie$_1$] gedacht
Maria has Prt often of her thought

b. Maria hat noch oft [PP da$_1$-r-an] gedacht
Maria has Prt often there$_{[-anim]}$-of thought

Finally, R-pronoun formation is obligatory in the case of reduced pronouns:

(20) a. *Maria hat noch oft [PP an es$_1$] gedacht
Maria has Prt often of it thought

b. Maria hat noch oft [PP da$_1$-r-an] gedacht
Maria has Prt often there$_{[+red]}$-of thought

The different behaviour of reduced, weak and unstressed/strong pronouns with respect to R-pronoun formation clearly shows that at least these three classes of pronouns must be recognized in the syntax of German; given the dividing line between reduced/weak/unstressed and strong pronouns with respect to Wackernagel movement, all four pronoun classes described in terms of features in (1) are now syntactically motivated. In what follows, I will derive the distribution of R-pronoun formation from the relative ranking of the C_{vP_i} Wackernagel constraints and two other constraints.

4.2. Analysis of R-Pronoun Formation

The basic observation is that PP-internal personal pronouns obey *vP$_i$/Pron, just like other personal pronouns. Therefore, we expect PP-internal unstressed, weak, and reduced pronouns to undergo Wackernagel movement. However, there is a problem for pronouns in this position: Personal pronouns are Case-marked, and PP is a barrier for extraction of Case-marked NPs in German. Only Case-less R-pronouns can be moved out of PP ("postposition stranding"). Compare (21-a) with (21-b).[14]

(21) a. *Maria hat [vP sie$_1$ noch oft [PP an t$_1$] gedacht]
Maria has her Prt often of thought

[14]See, e.g., Ross (1967), van Riemsdijk (1978), Kayne (1981), Fanselow (1983; 1991), Grewendorf (1989), Trissler (1993), Bayer (1994).

b. Maria hat [$_{vP}$ da$_1$ noch oft [$_{PP}$ t$_1$ an] gedacht]
Maria has there Prt often of thought

The locality constraint in question can be formulated as in (22); I assume that it is undominated among the constraints discussed in the present paper:[15]

(22) PP-Loc ("PP-Locality"):
NPs that receive Case from P must not move out of PP.

Thus, R-pronouns can move out of PP, but they do not have to: They do not obey *vP$_i$/Pron in the first place because they are adverbial pronouns, not personal pronouns. Hence, the R-pronoun in (21-b) is not Wackernagel-moved (triggered by *vP$_i$/Pron), but scrambled (triggered by some other factor). This view is reinforced by the fact that R-pronouns can show up in non-edge positions of vP (see (23-a)) and cannot show up in front of any Wackernagel pronoun (see (23-b)).

(23) a. Maria hat [$_{vP}$ mich gestern da$_1$ nicht [$_{PP}$ t$_1$ mit] beeindruckt]
Maria has me$_{acc}$ yesterday there not with impressed
b. *Maria hat [$_{vP}$ da$_1$ mich gestern nicht [$_{PP}$ t$_1$ mit] beeindruckt]
Maria has there me$_{acc}$ yesterday not with impressed

Thus, in PP-internal contexts, the situation arises that unstressed, weak, and reduced personal pronouns must undergo Wackernagel movement because of *vP$_i$/Pron; but they can never do so because of a higher-ranked PP-Loc.[16] Suppose now that we replace the selected personal pronoun with an unselected, adverbial R-pronoun, i.e., apply R-pronoun formation. This way, *vP$_i$/Pron and PP-Loc can both be fulfilled. However, the cost is a violation of a faithfulness constraint Faith(Sel) that requires lexical selection to be realized in the output:

(24) Faith(Sel):
Selected material of the input must be realized in the output.

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[15] PP-Loc can arguably be derived from the interaction of more general constraints. I will not pursue this matter here.

[16] One might think that *vP$_i$/Pron and PP-Loc could both be respected by PP-pied piping, as in the analogous *wh*-movement case in (i-a).

(i) a. [$_{PP_2}$ An [$_{NP}$ welche Frau]] hat Maria gestern t$_2$ gedacht ?
of which woman has Maria yesterday thought
b. *Maria hat [$_{PP_2}$ an [$_{NP}$ es$_1$]] noch oft t$_2$ gedacht
Maria has of it Prt often thought

(i-b) shows that this is not the case: PP-pied piping is not a way to fulfill *vP$_i$/Pron. Possibly, this difference is related to the fact that *wh*-movement targets a position that is structurally defined (SpecC), whereas Wackernagel movement targets a position that is both linearly and structurally defined: Given (12), *es* in (i-b) is not in a vP-external position. (More generally, it is already observed in Ross (1967) that movement types may differ with respect to pied piping options.)

I would like to contend that the relative ranking of FAITH(SEL) and the *vP$_i$/Pron constraints of the C$_{vP_i}$ hierarchy derives the impossibility, optionality, and obligatoriness of R-pronoun formation with the various pronoun classes. More specifically, suppose that the ranking in (16) above is extended as in (25).

(25) *Extended ranking in German*:
PP-LOC $\gg$ *vP$_i$/Pron$_r$ $\gg$ *vP$_i$/Pron$_w$ | FAITH(SEL) $\gg$ *vP$_i$/Pron$_u$ $\gg$ LR $\gg$ *vP$_i$/Pron$_s$

As we have seen, *vP$_i$/Pron$_u$ and *vP$_i$/Pron$_s$ differ in their ranking with respect to LR; but they do not differ in their ranking with respect to FAITH(SEL). Given the order FAITH(SEL) $\gg$ *vP$_i$/Pron$_u$, *vP$_i$/Pron$_s$ (and an undominated PP-LOC), strong and unstressed pronouns must remain in situ, within PP, in violation of the respective Wackernagel constraint. This is shown for unstressed pronouns in tableau T$_3$.[17]

T$_3$: Unstressed pronouns and R-pronouns

Input: [$_{PP}$ P ihr[+anim]], ..	PP-LOC	*vP$_i$/ Pron$_r$	*vP$_i$/ Pron$_w$ | FAITH (SEL)	*vP$_i$/ Pron$_u$	LR	*vP$_i$/ Pron$_s$
☞O$_1$: [$_{vP}$ .. [$_{PP}$ P ihr]..]			|	*		
O$_2$: [$_{vP}$ ihr .. [$_{PP}$ P t]..]	*!		|		*	
O$_3$: [$_{vP}$ .. [$_{PP}$ da-P]..]			| *!			

Next, *vP$_i$/Pron$_w$ and FAITH(SEL) are tied, i.e., equally ranked. This derives the optionality of R-pronoun formation with weak pronouns in PP-internal contexts. If the tie is resolved into the ranking *vP$_i$/Pron$_w$ $\gg$ FAITH(SEL), the optimal vP output has R-pronoun formation; if the tie is resolved into the ranking FAITH(SEL) $\gg$ *vP$_i$/Pron$_w$, the optimal vP output retains the personal pronoun within PP. This is shown in tableau T$_4$.

T$_4$: Weak pronouns and R-pronouns

Input: [$_{PP}$ P sie[–anim]], ...	PP-LOC	*vP$_i$/ Pron$_r$	*vP$_i$/ Pron$_w$ | FAITH (SEL)	*vP$_i$/ Pron$_u$	LR	*vP$_i$/ Pron$_s$
☞O$_1$: [$_{vP}$ .. [$_{PP}$ P sie]..]			*(!) |			
O$_2$: [$_{vP}$ sie .. [$_{PP}$ P t]..]	*!		|		*	
☞O$_3$: [$_{vP}$ .. [$_{PP}$ da-P]..]			| *(!)			

Finally, *vP$_i$/Pron$_r$ outranks FAITH(SEL). Hence, a pronoun *es* is obligatorily replaced with the R-pronoun *da* in PP-internal contexts; cf. tableau T$_5$.

[17] Again, I confine myself to the relevant local optimization procedure of the complete derivation, viz., that affecting vP. Note that the variable shape of PP documented in O$_1$, O$_2$ vs. O$_3$ supports the conclusion that PP itself is not yet an optimization domain; as remarked in footnote 10, a modification of the standard versions of the Strict Cycle Condition would be called for so as to permit backtracking if it were.

T_5: Reduced pronouns and R-pronouns

Input: [$_{PP}$ P es], ...	PP-LOC	*vP$_i$/ Pron$_r$	*vP$_i$/ Pron$_w$ | (SEL)	FAITH	*vP$_i$/ Pron$_u$	LR	*vP$_i$/ Pron$_s$
O$_1$: [$_{vP}$ .. [$_{PP}$ P es]..]		*!					
O$_2$: [$_{vP}$ es .. [$_{PP}$ P t]..]	*!					*	
☞O$_3$: [$_{vP}$ .. [$_{PP}$ da-P]..]				*			

This is the gist of the present account of R-pronoun formation in German.[18] However, certain other issues remain to be clarified. A first question is why it is the adverbial pronoun *da* that is chosen as the non-selected "repair" or "last resort" form that vacuously fulfills the *vP$_i$/Pron constraints of the Wackernagel hierarchy. I think the key to a solution is that *da* is the adverbial pronoun with the least specific semantics (an "Allerweltsproform", as Altmann (1981) puts it). Generality of meaning is characteristic of repair forms of this type; compare, e.g., the verb *do* that is used in English *do*-support constructions, or the *wh*-item corresponding to English *what* that is used in *wh*-scope marking constructions in languages like German, Hindi, and Hungarian. As regards *do*-support, Grimshaw (1997) argues that if an item that is not part of the input must be inserted in the optimal candidate, and a faithfulness violation is thus unavoidable, this violation must at least be kept minimal, and the relevant faithfulness constraint in her analysis is designed in such a way that items with more specific semantics will invariably violate it to a higher degree than items with less specific semantics. The minimal violation is incurred by the item with the least specific semantics that is appropriate in a given syntactic context; and in the case of verbs in English, this happens to be *do*. I assume that something similar can be said for the R-pronoun *da* in German.

Second, it is not a priori clear why the non-selected R-pronoun *da* shows up to the left of P, even though a selected NP must normally show up to the right of P. One possible solution would be to assume that *da* must form a complex word with P if it is adjacent to it. Complex word formation would then result in the reverse order, either because the head must be right-peripheral in morphology (and the head of the complex word is P), or because *da* would explicitly be marked as proclitic. However, more would have to be said given the contrast between *ab da* ("from there/then") and **da-r-ab* ("from there/then"), where *da* is a selected adverbial that is adjacent to the preposition *ab* and still shows up to the right of it, like selected NPs and unlike non-selected *da*. Another solution that evades this problem would be to assume a constraint outranking LR that demands that non-selected items must not show up in complement

[18] R-pronoun formation is not confined to arguments; it also takes place in adverbs. The account developed here thus presupposes that all adverbs are generated within vP. This conclusion does not strike me as particularly problematic as long as it is ensured that vP/VP offers a sufficient number of adverb and argument positions (which it does, given multiple specifiers), and that the c-command relations of different types of adverbs with respect to arguments and to each other can be accounted for without resort to designated functional projections related to adverb classes.

positions (this is essentially one part of Chomsky's (1981) Projection Principle). On this view, a non-selected *da* would have to move to a non-complement position, and the nearest such position would be a specifier to the left of P. For now, I will leave it at that, assuming that the linearization effect with R-pronoun formation can be accounted for in one of the ways envisaged here.

Third and finally, the question arises of whether the same kind of analysis can be given for the [+wh] pronoun *wo* that optionally replaces the weak NP pronoun *was* within PPs:

(26) a. [$_{PP_2}$ An was] hast du t_2 gedacht ?
of what have you thought

b. [$_{PP_2}$ Wo-r-an] hast du t_2 gedacht ?
where-of have you thought

Given that *was* is a weak pronoun that obeys *vP$_i$/Pron$_w$, the analysis is indeed identical to that of inanimate *sie* in tableau T_4: During vP optimization, the NP pronoun *was* must move to the left edge of vP but cannot do so because of a higher-ranked PP-LOC; the violation of *vP$_i$/Pron$_w$ that results from leaving *was* within PP, and the violation of FAITH(SEL) that results from replacing the NP pronoun with an R-pronoun *wo* are equally costly, and optionality arises. By this reasoning, we expect that the optimal derivation underlying a sentence like (27) involves Wackernagel movement of *was* ("what") to the left edge of vP during vP optimization, and subsequent *wh*-movement to SpecC during CP optimization.[19]

(27) Was$_1$ hat t'_1 Fritz gestern t_1 gemacht ?
what has Fritz yesterday done

5. Coordination

Cardinaletti & Starke (1996) point out that (what I call) weak and reduced pronouns (their "weak pronouns") cannot be coordinated in German, whereas unstressed and strong pronouns (their "strong pronouns") can be. This is shown by the data in (28).

(28) a. Maria hat [$_{NP}$ IHN [$_\alpha$ und seinen Freund]] zur Krippe gebracht
Maria has him and his friend to the day care taken

b. Maria hat [$_{NP}$ ihn$_{[+anim]}$ [$_\alpha$ und seinen Freund]] zur Krippe gebracht
Maria has and his friend to the day care taken

[19] At least at first sight, multiple questions seem to pose a problem for this approach because a clause-internal *was* can in fact not occupy the left edge of vP, but must stay in situ, within vP:

(i) Wann hat (?*was$_1$) der Fritz gestern (was$_1$) gemacht ?
when has what ART Fritz yesterday what done

However, there is an intervening factor. In general, a *wh*-in situ item in a multiple question in German must be stressed. If this is so, the ban on Wackernagel movement of *was* in (i) is accounted for.

c. *Maria hat [$_{\text{NP}}$ ihn $_{[-anim]}$ [$_{\alpha}$ und das Fahrrad]] zur Werkstatt gebracht
Maria has him and the bicycle to the garage taken

d. *Maria hat [$_{\text{NP}}$ es [$_{\alpha}$ und die Zeitung]] gekauft
Maria has it and the newspaper bought

Particularly relevant here is the contrast between (28-b) and (28-c). If *ihn* is interpreted as animate (e.g., as referring to a young boy), coordination is possible; if *ihn* is interpreted as inanimate (e.g., as referring to a scooter), coordination is impossible. The analysis I would like to suggest is similar to that of R-pronoun formation. As we have seen, constraints of the type *vP$_i$/Pron trigger Wackernagel movement. However, the Coordinate Structure Constraint (Csc) blocks extraction of (and out of) conjuncts (see Ross (1967)).

(29) Csc ("Coordinate Structure Constraint"):
No item can undergo leftward movement out of a coordinate structure.

Given that the Csc is ranked high, like PP-Loc, the pronouns in (28) cannot be extracted out of the coordinate NP in order to move to the Wackernagel position.[20] Thus, the situation is comparable to that found with PP-internal contexts. However, this time, R-pronoun formation does not apply; compare (30) with (28-c).

(30) *Maria hat [$_{\text{NP}}$ da(-r-) $_{[-anim]}$ und das Fahrrad] zur Werkstatt gebracht
Maria has him and the bicycle to the garage taken

This means that R-pronouns in coordinate structures violate some higher-ranked constraint (various possibilities come to mind, one being the well-known parallelism constraint on coordination, another one a lexical property of *und* ("and") that precludes R-pronoun formation). What, then, is the optimal candidate that blocks (28-c) and (28-d)? This is an instance of a standard question arising in optimality theory: How is absolute ungrammaticality (ineffability) derived? For the sake of concreteness, I will assume that the optimal candidate that blocks (28-c), (28-d) is one in which α moves out of the coordinate structure by extraposition, i.e., rightward movement. This violates LR and the faithfulness constraint in (31), but not the Csc.

(31) Faith(Lex):
Lexical material in the output must be present in the input.

This constraint belongs to the class of so-called Dep (dependency) constraints which prohibit epenthesis in phonology. In the case at hand, Faith(Lex) prohibits the insertion of non-input *auch* ("too") which is, however, required to support the extraposed category α. The candidate that blocks (28-c) is (32); α moves rightward and thereby destroys the coordinate structure, which enables *ihn* to undergo Wackernagel movement

[20] This shows that the edge of vP cannot be defined in a purely linear way: Even scrambling of the coordinate NP to a Specv position does not fulfill *vP$_i$/Pron. Under present assumptions, this follows because the pronoun in the coordinate NP is not moved to Specv in this case; cf. (12).

in accordance with the CSC.

(32) Maria hat [$_{vP}$ ihn$_1$ t_1 t_α zur Werkstatt gebracht] und [$_\alpha$ das Fahrrad
Maria has him$_{[-anim]}$ to the garage taken and the bicycle
*(auch)]
too

FAITH(LEX) must be ranked lower than *vP$_i$/Pron$_{r,w}$, but higher than *vP$_i$/Pron$_{u,s}$. The following two tableaux illustrate the two representative cases in (28-b) and (28-c). On the one hand, T_6 explains why unstressed (hence, strong) pronouns can be coordinated. The optimal candidate violates *vP$_i$/Pron$_u$ in order to respect the higher-ranked FAITH(LEX).

T_6: vP optimization: unstressed pronouns and coordination

Input: [$_{NP}$ ihn[+anim] & NP], ..	CSC	*vP$_i$/ Pron$_r$	*vP$_i$/ Pron$_w$	FAITH (L)	*vP$_i$/ Pron$_u$	LR	*vP$_i$/ Pron$_s$
☞O$_1$: [$_{vP}$ .. [$_{NP}$ ihn α]..]					*		
O$_2$: [$_{vP}$ ihn..[$_{NP}$ t α]..]	*!					*	
O$_3$: [$_{vP}$ ihn.. t..t$_\alpha$..] .. α auch				*!		**	

On the other hand, T_7 shows why weak (hence, reduced) pronouns cannot undergo coordination. The optimal candidate violates FAITH(LEX) to respect the higher-ranked *vP$_i$/Pron$_w$ by applying Wackernagel movement.[21]

T_7: vP optimization: weak pronouns and coordination

Input: [$_{NP}$ ihn[–anim] & NP], ..	CSC	*vP$_i$/ Pron$_r$	*vP$_i$/ Pron$_w$	FAITH (L)	*vP$_i$/ Pron$_u$	LR	*vP$_i$/ Pron$_s$
O$_1$: [$_{vP}$ .. [$_{NP}$ ihn α]..]			*!				
O$_2$: [$_{vP}$ ihn..[$_{NP}$ t α]..]	*!					*	
☞O$_3$: [$_{vP}$ ihn.. t..t$_\alpha$..] .. α auch				*		**	

6. Topicalization

Cardinaletti & Starke (1996) observe that the dividing line among pronouns with respect to coordination also exists in the domain of topicalization. Topicalization of unstressed and strong pronouns is possible; see (33-ab). In contrast, topicalization of

[21] Note that O_3 in T_6 and O_3 in T_7 (with an unstressed and weak pronoun, respectively) are both optimal candidates in other competitions in which they do not violate FAITH(LEX) or LR because a feature is present that triggers extraposition of α, and the additional lexical item *auch* is already part of the input. Thus, what happens in T_7 is a neutralization of input specification: Regardless of whether features and lexical material that trigger α extraposition are present in the input in this context, α extraposition will take place in the output. See Legendre, Smolensky, & Wilson (1998), Baković & Keer (2001) and Vogel (2001), among others, for further applications of input neutralization as a means to account for ineffability.

weak and reduced (object) pronouns is impossible; see (33-cd) (on subject pronouns, see below).

(33) a. IHN$_1$ hat Maria t_1 geküßt
him has Maria kissed

b. Ihn$_1$ hat Maria t_1 geküßt
him has Maria kissed

c. *Ihn$_1$ hat Maria t_1 repariert
him has Maria fixed

d. *Es$_1$ habe ich t_1 gelesen
it have I read

Again, a striking contrast arises between (33-b), where *ihn* is interpreted as animate (e.g., as referring to Fritz), and (33-c), where *ihn* is interpreted as inanimate (e.g., as referring to a car). The data lend themselves to an analysis that is similar to the one developed for R-pronoun formation and coordination. The role of PP-LOC and CSC is played by TOP-EDGE, and the role of FAITH(SEL) and FAITH(LEX) by FAITH(TOP).

(34) a. TOP-EDGE:
Topics must not be at the edge of vP.

b. FAITH(TOP):
A topic feature in the input must be present in the output.

Suppose that items are marked as topics by a [+top] feature in the input; that TOP-EDGE is ranked higher than all C_{vP_i} constraints; and that FAITH(TOP) intervenes between *vP$_i$/Pron$_w$ and *vP$_i$/Pron$_u$. T_8 then shows that with a [+top]-marked unstressed (or strong) pronoun in the input, the optimal vP is not one in which the pronoun undergoes Wackernagel movement – either as a [+top] pronoun (which would fatally violate TOP-EDGE), or as a pronoun from which the [+top] feature has been removed (which would fatally violate FAITH(TOP)). Rather, the optimal vP output here is one in which the [+top] pronoun stays in situ, in violation of *vP$_i$/Pron$_u$.

T_8: vP optimization: unstressed pronouns & topicalization

Input: ihn[+anim],[+top], ...	TOP-EDGE	*vP$_i$/Pron$_r$	*vP$_i$/Pron$_w$	FAITH (TOP)	*vP$_i$/Pron$_u$	LR	*vP$_i$/Pron$_s$
☞O$_1$: [$_{vP}$ .. ihn$_1$[+top] .. V]					*		
O$_2$: [$_{vP}$ ihn$_1$[+top] .. t_1 .. V]	*!					*	
O$_3$: [$_{vP}$ ihn$_1$[ ] .. t_1 .. V]				*!		*	

If, on the other hand, the [+top]-marked pronoun in the input is weak (or reduced), the optimal vP output will involve deletion of the feature [+top] on the pronoun and movement to the edge of vP. This is shown in T_9.[22]

[22]In both competitions, there is another candidate O$_4$ that deletes the [+top] feature and leaves the pronoun in situ. Since this output violates *vP$_i$/Pron and FAITH(TOP), its constraint profile is always

T_9: vP optimization: weak pronouns & topicalization

Input: ihn[–anim],[+top], ...	Top-Edge	*vP$_i$/ Pron$_r$	*vP$_i$/ Pron$_w$	Faith (Top)	*vP$_i$/ Pron$_u$	LR	*vP$_i$/ Pron$_s$
O_1: [$_{vP}$ .. ihn$_1$[+top] .. V]			*!				
O_2: [$_{vP}$ ihn$_1$[+top] .. t$_1$ .. V]	*!					*	
☞O_3: [$_{vP}$ ihn$_1$[ ] .. t$_1$ .. V]				*		*	

Thus far, T_8 and T_9 show that the optimal vP is different with unstressed/strong vs. weak/reduced pronouns. However, this, per se, does not yet tell us why topicalization is possible with the former class and impossible with the latter. Here, one additional assumption is necessary: Suppose that topicalization is regular, feature-driven movement that is triggered by a general constraint Feature Condition (FC) which implies that a [+top]-marked item must move to the specifier of a C head that has a matching [+top] feature (a C head with a [+top] feature also triggers V/2 movement in German). FC outranks LR in German and becomes active in the CP cycle (see Vikner (2001)). Now, an account of the topicalization asymmetry is straightforward: vP optimization maintains the [+top] feature of an unstressed (or strong) pronoun; hence, subsequent CP optimization can fulfill FC only by topicalizing the pronoun. In contrast, vP optimization removes the [+top] feature of a weak (or reduced) pronoun; consequently, subsequent CP optimization can fulfill FC vacuously without topicalizing the pronoun, and such topicalization will be blocked by the low-ranked constraint LR. In a nutshell, the earlier vP optimization procedure has turned a topic pronoun into a non-topic pronoun (as yet another instance of input neutralization), and pronoun topicalization is thus blocked.[23]

Of course, there is again much more to be said about the construction at hand, and many issues have to be left unresolved. Let me just briefly address two issues that are potentially problematic for the approach developed here. First, Gärtner & Steinbach (2000, 35-36) contend that topicalization of (what I call) weak and reduced pronouns should not be excluded syntactically, and they try to substantiate this claim by providing examples (partly from dialectal varieties of German) that are analogous to (33-c) and (33-d), but seem well formed. Interestingly, though, all their examples either involve genuine phonological clitics, or can be argued to involve reductions of the demonstrative pronoun *das* rather than weak personal pronouns *es*. I conclude from this that the generalization that weak and reduced object pronouns cannot undergo topicalization is not undermined by the empirical evidence presented there.[24]

worse than that of O_1; O_4 is "harmonically bounded" by O_1 (see Prince & Smolensky (1993)).

[23] A reviewer notes that examples like (33-b) are not acceptable for some speakers. This can straightforwardly be accounted for by assuming microparametric variation in the form of a reranking of Faith(Top) and *vP$_i$/Pron$_u$ in these varieties. This would leave all other reasonings intact; in particular, the implicational generalizations that can be derived by harmonic alignment remain valid.

[24] That said, should cases that are truly analogous to (33-c) and (33-d) be acceptable in some varieties, this could be accounted for in the present system by ranking Faith(Top) higher than *vP$_i$/Pron$_{r,w}$;

Second, it has often been observed that weak and reduced subject pronouns can show up in what looks like a topic position in German:

(35) Es hat mich beeindruckt
it$_{nom}$ has me$_{acc}$ impressed

Travis's (1984) conclusion is that subjects can occur in a SpecV/2 position without being topicalized, due to a left-periphal I node in German. This would in principle be compatible with the analysis developed here. Alternatively, one might argue that subject pronouns do in fact not undergo Wackernagel movement to the left edge of vP but stay in situ, raising to SpecT in the following CP cycle. If that is so, all subject pronouns can survive vP optimization with a [+top] feature, and can therefore be NP-raised and topicalized during CP optimization. I will leave this question open.

7. Conclusion

I have shown that by applying harmonic alignment to two simple hierarchies involving pronouns and positions, a set of *vP$_i$/Pron constraints can be derived. These constraints trigger displacement of pronouns, and they have a fixed internal order. In interaction with the economy constraint LR, these constraints directly account for the distribution of Wackernagel effects in German. The Wackernagel constraints are dominated by certain constraints on movement (PP-Loc, Csc, Top-Edge), and they are interspersed with certain faithfulness constraints (Faith(Sel), Faith(Lex), Faith(Top)); this way, they indirectly also account for the distribution of R-pronoun formation, and coordination and topicalization of pronouns in German. Because of the fixed order resulting from harmonic alignment, implicational generalizations that hold in these domains (modulo intervening factors like, e.g., additional morphophonological constraints in the case of clitic pronouns) can be captured: If a given pronoun has property P, then all weaker pronouns also exhibit P (where P stands for properties like "undergoes Wackernagel movement", "permits/forces R-pronoun formation", "cannot undergo coordination", and "cannot undergo topicalization"). We have seen that there are three distinct dividing lines, which necessitates four pronoun classes. First, in the case of Wackernagel movement, there is a dividing line between strong pronouns on the one hand and unstressed, weak, and reduced pronouns on the other. Second, R-pronoun formation involves two dividing lines: one between strong or unstressed pronouns and weak pronouns, and another one between weak pronouns and reduced pronouns. This already suffices to motivate the four pronoun classes. Third, in the domains of coordination and topicalization, there is a dividing line between strong and unstressed pronouns on the one hand, and weak and reduced pronouns on the other.[25] Since the account

see the last footnote.

[25]Thus, as long as one restricts the attention to these latter domains, one can do without a distinction between weak and reduced pronouns, as in Cardinaletti & Starke (1996). The distinction between weak

of R-pronoun formation, coordination, and topicalization is dependent on the account of Wackernagel movement, and since the pronoun classes have been shown to behave in a non-uniform way with respect to these empirical domains, the present approach crucially presupposes that *vP$_i$/Pron constraints are violable and ranked.[26] Thus, the analysis supports an optimality-theoretic approach; more specifically, one that is local (rather than global), and that relies on harmonic alignment. Local optimization can be shown to significantly reduce the size of candidate sets (see Heck & Müller (2000b)), and harmonic alignment clearly reduces the factorial typology that results from free re-ranking of constraints. Hence, the present approach can also be viewed as part of the more general enterprise to tackle the problem of complexity in optimality-theoretic syntax.

and reduced pronouns is solely motivated by the evidence from R-pronoun formation.

[26]For instance, *vP$_i$/Pron$_w$ cannot be violated by a well-formed sentence in simple clause, coordination, and topicalization contexts, but it can be violated by a well-formed sentence in a PP-internal context. Similarly, *vP$_i$/Pron$_u$ cannot be violated by a well-formed sentence in simple clause contexts, but it can be violated in PP-internal, coordination, and topicalization contexts.

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