

# Word-Formation in Optimality Theory



# WORD FORMATION AND OPTIMALITY THEORY

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## *1. Introduction*

### 1.1 Optimality Theory

A grammar can be defined as the set of principles that distinguish the possible morpheme combinations, word combinations and sound combinations in a language from the impossible ones. In traditional grammars a possible word, sentence or syllable is one that satisfies all the principles pertaining to it. Data may be accounted for by a conspiracy of principles, but the principles themselves do not compete with one another. No principle is violated in order to avoid violating another principle. In fact, no principles are violated at all in a grammatical sentence; violation of even a single grammatical principle inexorably means ungrammaticality.

In recent years, theories of grammar have come up in which this no longer holds true, in particular Optimality Theory (henceforth OT) (see Prince and Smolensky 2004 [1993]). This theories emphasizes the role of *competition* in determining which forms are grammatical and which are not. The crucial question is which of a number of forms that compete for the realization of a particular concept satisfies the principles of grammar better than the others (where 'better' is defined in a precise way, to be discussed shortly). This will be the grammatical structure. This implies that grammatical structures can violate principles of grammar – as long as there is no competitor that does better. This also implies that different principles of grammar can impose demands on structure that are in direct conflict (meaning that in any structure at least one of them will be violated).

Let us sketch the outlines of an OT-style grammar in a bit more detail.[1] Such a grammar consists of two components. The first is a device, called GEN(erator), that determines how elements can be combined into a structure. The demands that GEN imposes on structures cannot be violated. (Thus, there remains room for inviolable principles in OT). Below, we will assume a minimal GEN component for morphology, one in which an operation of merger is applied to morphemes, so that hierarchically ordered structures for words are built. This parallels the building of structure in syntax, but the morphological GENerator is distinct from the syntactic one and builds structures specifically for the sub-word level. In other words, we assume word structures are not the result of operations in phrasal syntax such as head movement. For a defense of such a specific 'word syntax' component to build morphological structure, see Ackema & Neeleman 2004; we will have nothing further to say on it here.

The second component of an OT-grammar is an evaluation metric that chooses from the output of GEN the structure that best satisfies a set of universal constraints. These constraints are all violable. Their impact in a specific language follows from a language-particular constraint ranking, against which the various candidate structures are evaluated.

Evaluation proceeds as follows. The structures to be compared (which make up the so-called candidate set) are first evaluated with respect to the highest-ranked constraint. In case two or more candidates receive an equal score, they are judged by the next highest constraint. In case there is still more than one surviving candidate, they are judges on the third constraint, and so on. The candidate that finally survives this procedure is optimal and thereby grammatical. The other

[1] For a detailed introduction see for example Kager 1999.

ones are all ungrammatical – they are blocked by the optimal one. As noted, a consequence of this view of constraint interaction is that no constraint is necessarily surface true. A lower ranked constraint can be violated in an optimal structure when this structure scores better on a higher ranked constraint than its competitors. Even the highest-ranked constraint can be violated, namely in case there is no potential output that does not violate it.

The question we will address in this chapter is whether the OT view on grammar, with its emphasis on competition between forms expressing the same concept, can be advantageously applied to problems of word formation.[2] We will see that, indeed, there are a number of phenomena that seem to ask for an account in terms of competition.

## 1.2 Competition in morphology

The idea that morphological forms can be in competition, so that one form may block another, is in fact crucially involved in one of the oldest regulatory principles in linguistics, nowadays usually known as the Elsewhere Principle.

A well-known English example is the regular past tense of the verb *go*, i.e. *goed*. Although morphologically well-formed, this form seems to be blocked by the irregular *went*. One pattern frequently found in cases of blocking is that the availability of more specific forms excludes the use of more general ones. Thus, in the case just mentioned, the question is how to form the past tense of *go*, that is, how to realize the morpho-syntactic structure in (1a) (here and below we assume a realizational model of affixation; see Halle & Marantz 1993, Beard 1995; for the specific assumptions we make, see Ackema & Neeleman 2004). The English lexicon contains the following relevant morphemes: *go*, *-ed* (which is specified as past), and *went* (which is specified as the past of *go*). Since *went* spells out the most features in a single morpheme, it is the most specific form, and the one favoured in the competition (as indicated by ☞):

(1) a. [GO PAST] (morphosyntax)
b. [/go/ /ed/] (morphophonology)
b'. ☞ [/went/] (morphophonology)

The structure of inflectional paradigms can often be described in these terms. The most general form is usually called the elsewhere form, since it will be inserted where no more specific form is available. The Elsewhere Principle, which regulates competition in the way described above, was introduced into generative grammar by Anderson (1968) and Kiparsky (1973). The general idea reportedly goes all the way back to Panini.

As outlined in section 1.1., such a notion of competition forms the very basis of OT, but it can be found in more or less limited forms in other frameworks as well, such as some versions of Minimalism (see Chomsky 1995) and Williams' (2003) Representation Theory. Below we will explore the type of morphological phenomena that can be analyzed in terms of competition. We will show that there are three relevant types of competition: (i) competition between different morphemes (of which classical Elsewhere cases are an instance), (ii) competition between different orderings of the same morphemes, and (iii) competition between morphological and syntactic realization of the same concept. As a second aim, we will consider in how far OT is a suitable framework to deal with these kinds of morphological competition, or whether in some cases additional or different assumptions about grammar are required.

[2] We include inflectional phenomena in this concept, because some of the relevant phenomena only occur with inflectional morphology. We will indicate where this is the case in the relevant places.

*2. Competition between different morphemes*

2.1 The basic case

As pointed out in section 1, the classical case of competition between different morphemes deals with the structure of inflectional systems, and can be described in terms of the Elsewhere Principle. In order to illustrate the general reasoning in some more detail, we consider Dutch verbal agreement in the present tense. The relevant paradigm is as follows:[3]

(2)

| | |
|---|---|
| ik loop | wij lop-en |
| *I walk* | *we walk-PL* |
| jij loop-t | jullie lop-en |
| *you walk-2.SG* | *you-pl walk-PL* |
| hij loop-t | zij lop-en |
| *he walk-3.SG* | *they walk-PL* |

The most economical way of describing the distribution of affixes is in terms of three monovalent features: PAR(TICIPANT), ADD(RESSEE) and PL(URAL). The realization of inflection can be accounted for if the Dutch lexicon contains the following specified affixes; we use subscripts to distinguish between homophonous, but distinct affixes:[4]

(3)

$\varnothing \leftrightarrow$ [PAR]
$-t_1 \leftrightarrow$ [PAR, ADD]
-en $\leftrightarrow$ [PL]
elsewhere: $-t_2$

We assume that morphosyntactic structure is fully specified for person and number features. The workings of the Elsewhere Principle can be illustrated in various ways, even for this simple inflectional system. Consider first the singular. In the first person, the information in the morpho-syntactic structure is that the verb is specified as [PAR]. Two of the affixes in (3), namely *–en* and $–t_1$, spell out features that are not present in morphosyntax in this case, and hence do not qualify as candidates (though see section 2.2). The choice, then, is between the zero ending and the elsewhere *–t* ending. Since the former is more richly specified, it blocks the latter.

In the second person singular, the question is how to spell out [PAR, ADD]. In this case there are three candidates with a feature specification that does not spell-out too much. Clearly, of these three, $-t_1$ is the most richly specified, and hence favoured by the Elsewhere Principle. The third person singular is characterized in morphosyntax by the absence of phi-features. Hence, the only possible spell-out for it is $–t_2$.

In the plural, the morphosyntax will contain the same feature specifications for the various persons as in the singular; in addition, a [PL] feature is present. As it stands, the

[3] The alternation between double *oo* in the stem in the singular and single *o* in the plural does not represent any difference in the quality of the vowel, but is an idiosyncracy of Dutch orthography (long vowels are spelled doubly in closed syllables).

[4] The syncretism between the second person and third person singular is accidental. Many dialects still show a distinct *–st* ending for the second person singular. The *–t* ending derives from an older second person plural ending, and is not an extension of the third person singular.

Elsewhere Principle cannot determine which of the affixes in (3) should be used. Consider, for example, the first person plural, specified in the morphosyntax as [PAR, PL]. There are three candidates compatible with this specification: -∅, *-en* and $–t_2$. Whereas least-specified $-t_2$ is blocked by the other two candidate realizations, the Elsewhere Principle cannot decide between -∅ and *–en* as it stands, because neither contains a superset of the features of the other. The use of a single form in the plural suggests that the features [PAR] and [ADD] are neutralized in this context. This phenomenon can be accounted for using a context-sensitive rule of feature deletion that applies before spell-out (the point at which it is determined which of the affixes is to be used). In the case at hand, the feature [PAR] is deleted in the context of the feature [PL]:

(4) $[\text{PAR}] \rightarrow \varnothing \; / \; \_\_ \; [\text{PL}]$

The result for the first person plural is trivial, as its morphosyntactic specification will now be just [PL]. Hence, *-en* is used. The same is true of the third person, where the rule in (4) applies vacuously. After application of (4), the second person plural will be specified as [ADD, PL]. This specification excludes the use of $–t_1$, which spells out [PAR], so that we are left with *–en* for this case as well. (The type of rule that deletes features prior to spell-out is referred to as impoverishment in the literature on Distributed Morphology; for relevant discussion, see Bonet 1991 and Harley and Noyer 1999).

The assumption that the second person is more richly specified than the first, rather than the other way around, is supported by a curious instance of impoverishment: when the verb inverts with the subject, the zero affix is used for the second person singular, rather than $–t_1$, as shown in (5a). (This cannot be the effect of a phonological rule of *t*-deletion, as a comparison with the third person verb in (5b), which retains its *-t* ending, makes clear).

(5) a. Loop jij?
*walk you*
'do you walk?'
b. Loopt Jan?
*walks John*
'Does John walk?'

This phenomenon can be analyzed in terms of another context-sensitive impoverishment rule that deletes the feature [ADD] and applies under inversion (see Ackema & Neeleman 2004 for details).

The discussion so far illustrates that elsewhere relations hold not only between a single default form and the rest of the affix inventory, but in fact for any two affixes whose features stand in a subset-superset relation. Yet, there is of course one morpheme in many affix inventories that is the least specified, and hence the ultimate elsewhere form. In the Dutch agreement paradigm, this is the completely unspecified $–t_2$. That this affix is a true elsewhere form, rather than it being specified for some third person feature, can be seen in so-called impersonal constructions. An example is the impersonal passive:

(6) Hier gaat niet gelachen worden!
*here goes not laughed be*
'There will be no laughing here!'

In such structures there is no subject for the verb to agree with, yet the $-t_2$ ending obligatorily shows up on the verb.[5]

## 2.2 Haplology

Whereas the most basic cases of competition between morphemes are governed by the Elsewhere Principle only, there are various types of competition that involve other conditions. Once such condition is what Menn and MacWhinney (1984) call the Repeated Morph Constraint, a condition disfavouring adjacent morphemes that have an identical (or very similar) form. Suppose that there are two adjacent positions $P_1$ and $P_2$ in the morphosyntactic structure of some word. Suppose, furthermore, that if we look at the specifications of the morphemes in the lexicon of the language and simply apply the Elsewhere Principle, we would expect $P_1$ to be spelled out by $m_1$, while $P_2$ would be spelled out by $m_2$. If $m_1$ and $m_2$ have an identical form, or if $m_1$ ends in a string identical to $m_2$, languages may choose a spell-out different from $m_1$-$m_2$, in order to avoid a violation of the Repeated Morph Constraint.

There are four strategies in which languages deal with violations of the Repeated Morph Constraint. The first is to simply tolerate the violation, as happens in the English comparative of *clever*, which is *cleverer*. The second is to rule out spell-out of the morphosyntactic construction in question altogether. This applies to a case like English **uglily*, for which a circumscription is required, such as *in an ugly way*. In addition to this, one of the offending morphemes can fail to be spelled out separately, or it can be spelled out by a form which is not normally the optimal spell-out for the feature combination in question. We will now discuss some examples of the latter two strategies.

A simple case of non-spell-out is presented by the English genitive of plural nouns. Since both the genitive and the plural are marked by *–s*, the genitive of a plural noun should end in *–s–s*. But in fact, such expressions end in *–s* (see (7c)). Note that there is no problem in the genitive *–s* attaching to irregular plurals (see (7d), so that we indeed seem to be dealing with a case of haplology, rather than with morphological incompatibility of plural and genitive. Note, moreover, that the genitive *–s* can be attached to certain underived words ending in /s/, showing that we are not dealing with a purely phonological phenomenon either (see (7e)). (The issues involved are discussed in more detail in Yip 1998)

(7) a. The girl's house
b. *The girls's house
c. The girls' house
d. The women's house
e. Professor S.'s lectures

[5] The only way to avoid the conclusion that *–t* does not spell out agreement features here, is to assume that there is an empty third person singular expletive in impersonal constructions. It is unlikely that such an expletive exists, given that it cannot satisfy the verb-second requirement that holds in Dutch main clauses: **gaat hier niet gelachen worden!* 'goes here not laughed be'. The postulation of an empty expletive in fact comes down to making an untestable assumption.

A similar pattern is found in Spanish clitic clusters. Grimshaw (1997) points out that at least in some dialects a sequence of a reflexive and an impersonal clitic, expected to surface as *se se* sequence, surfaces as a single clitic instead:

(8) Se (*se) lava
*one oneself washes*
'One washes oneself'

The fourth strategy to deal with repeated morph cases, which consists of spelling out one of the offending morphemes by using an 'unexpected' candidate, can also be illustrated by clitic clusters. In certain variants of Italian, in structures comparable to (8) one of the clitics is realized by a clitic (*ci*) that is used otherwise for the first person plural (see Bonet 1995 and Grimshaw 1997):

(9) a. Lo si sveglia — Impersonal *si*
*3.ACC IMPERS wakes.up*
'One wakes him up'
b. Se lo compra — Reflexive *se/si*
*REFL 3-ACC buys*
'S/he buys it for himself/herself'
c. Ci/*Se si lava — Impersonal plus reflexive
*IMPERS REFL washes*
'one washes oneself'

A similar case from Spanish is the phenomenon known as 'spurious *se*' (see Perlmutter 1971 and Bonet 1995). Where one would expect to find a sequence of the third person dative clitic *le* and the third person accusative clitic *lo*, the dative is replaced by *se*, a clitic that is otherwise used in various different structures (such as impersonal, reflexive and unaccusative structures). Note, by the way, that this example demonstrates that the Repeated Morph Constraint is violated by two forms that are phonologically similar, but not absolutely identical, something we cannot go into here.

(10) a. El premio, lo dieron a Pedro ayer
*the prize 3ACC gave-3PL to Pedro yesterday*
'The prize, they gave it to Pedro yesterday'
b. A Pedro, le dieron el premio ayer
*to Pedro, 3DAT gave-3PL the prize yesterday*
'Pedro, they gave the prize to him yesterday'
c. A Pedro, el premio, se/*le lo dieron ayer
*to Pedro, the prize, SE/3DAT 3ACC gave-3PL yesterday*

Note that, although they both involve suppletion, there is a difference between the cases in (9) and (10). In the former, a violation of the Repeated Morph Constraint is avoided by using a clitic that is more richly specified than the clitic it replaces (the first person feature of *ci* is not present in morphosyntax). In the latter case, a clitic is used that spells out less features than are present in

morphosyntax (arguably, the clitic *se* is highly underspecied; it certainly lacks the number and case features present in *le*)

In the rest of this section we will discuss why an analysis in terms of competition, and more specifically an OT account in which forms are evaluated against a set of ranked, violable constraints, may be the best way to deal with some properties of repeated morph effects (in particular the cross-linguistic variation we see in the way the problem is dealt with).

In structures that potentially violate the Repeated Morph Constraint, various factors come into play. The first is, of course, the Repeated Morph Constraint itself (see (11a). We have already encountered some other conditions in section 2.1 (where we treated them as unviolable). For a start, each feature bundle in the morphosyntax should receive a realization in the morphophonological output. We will split this condition into two constraints. The first requires a transparent match between morphosyntactic structure and morphophonology: it is violated if there is a lack of one-to-one mapping between the two (see (11b)). The second requires that phi-features are realized by phonological material that is specified for the right features (see (11c)). Finally, no features may be spelled out that are absent in the morphosyntax. Thus, affixes that are lexically specified for some feature F may not be used for inputs that lack F (see (11d)). These constraints are independently motivated, in that they play an essential role in the analysis of various other linguistic phenomena (note that the Repeated Morph Constraint can be seen as a subcase of the OCP).

(11) a. *Repeated Morph Constraint*
*$M_1$ $M_2$ if $M_1 = M_2$

b. *Iconicity*
One element in the morphophonological structure is the realization of one element in the morphosyntactic structure

c. *Parse*
Assign to each feature in the morphosyntax a properly specified morpho-phonological realization

c. *Faithfulness*
The morphophonology does not realize features absent in the morphosyntax

In the OT conception of grammar, (11a-d) must be violable constraints that are ranked in a language-particular order with respect to each other and with respect to other constraints.

Let us therefore consider the patterns of constraint violation induced by the logically possible strategies to deal with repeated morphs. Suppletion with an overspecified form involves the use of a morpheme that spells out more features than are present in the morphosyntactic input. This satisfies all conditions except Faithfulness.

Suppletion with an underspecified form satisfies Faithfulness, but violates Parse. There are two related strategies that underparse the input. The first is not to realize one of the offending morphs. This violates Parse, but also Iconicity. The second is to not realize the morphosyntactic input at all; that is, to use the so-called null parse. Of course this violates Parse, but it arguably does not violate Iconicity: since there is no morphophonological structure, the morphophonology cannot be non-iconic either.

A further strategy is to associate the two morphosyntactic feature bundles to a single phoneme (whose form will of course be suitable to spell out both, given that we are dealing with repeated morphs). This coalescence strategy satisfies Parse, as well as Faithfulness, but it

violates Iconicity, as it involves two-to-one mapping between morphosyntax and morphophonology.

Finally, repeated morphs can be tolerated, something that obviously violates the Repeated Morph Constraint, but none of the other conditions. The various constraint violation patterns are given in (12). (The asterisk between brackets in the column under Parse indicates that the number of violations of this constraint that is induced by the null parse depends on the number of features that are present in the morphosyntactic structure).

(12)

| | RMC | Iconicity | Parse | Faithfulness |
|---|---|---|---|---|
| Suppletion (overspecified form) | | | | * |
| Suppletion (underspecified form) | | | * | |
| Avoidance (null parse) | | | * (*…) | |
| Coalescence | | * | | |
| Deletion | | * | * | |
| Tolerance | * | | | |

The ranking of the four constraints determines which strategy is employed. The crucial factor is which constraint is ranked lowest. (i) If this is Faithfulness, we will get suppletion with an overspecified form. (ii) If it is Parse, there are two possibilities, namely suppletion with an underspecified form and avoidance. Which of these is chosen depends on the lexical inventory of the language. Given that Parse prefers the spell-out of some features over the spell-out of none, suppletion will block avoidance whenever there is a phoneme that can realize a subset of the features in the morphosyntactic input. In the absence of such a phoneme, we will get avoidance, that is, the repeated morph construction is not allowed to surface. (iii) If Iconicity is the lowest ranked constraint, the best solution is to link both morphosyntactic feature bundles to a single phoneme. Finally, (iv) if the Repeated Morph Constraint itself is ranked lowest, the result is tolerance of repeated morphs.

Given that the four strategies result from the low ranking of four different constraints, an OT-account along the lines just sketched would appear to be purely descriptive. However, such an analysis has two potentially attractive properties. The first is that it rules out deletion as a strategy. This is because it incurs violations on both Iconicity and Parse. Since there are strategies that violate only Iconicity (namely coalescence) or only Parse (namely avoidance and suppletion with an underspecified form), deletion will not be the optimal strategy under any ranking of the constraints (in the terminology of OT, the candidate involving deletion is harmonically bounded by the candidates involving the other strategies just mentioned). This implies that in all cases where repeated morphs are spelled out by a single phoneme, this phoneme must be associated with both morphemes, rather than with just one of them. It might seem that this is a difficult prediction to test, but recently De Lacy (1999) has provided empirical evidence that indicates that the relevant cases indeed involve coalescence rather than deletion.

A second potentially correct prediction is that suppletion strategies can only apply to forms that are part of a paradigm, and not to derivational affixes, compounds and the like.

Suppletion only make sense if there are morphemes whose feature specification is either a superset or a subset of one of the feature bundles present in morphosyntax. Such elsewhere relations typically hold of functional morphemes (see section 2.1), but not of lexical ones. Indeed, as far as we know, repeated morph constructions involving derivational morphology or compounding are either tolerated (as in English *ex-ex-president* and Afrikaans *boon-tjie-tjie* 'bean-DIM-DIM') or avoided (as in English **uglily* and Dutch **kop-je-je* 'cup-DIM-DIM'), but they never involve suppletion. (Strictly speaking, we could expect to find cases of coalescence with lexical morphemes, but in order to test this one has to find sequences of semantically different but phonologically identical derivational affixes that are in principle grammatical. We have not been able to do so.)

Within a single language, not every repeated morph context will be dealt with in the same way (as will be clear from the English mentioned in the discussion above). One might hope that this variation is partially due to the fact that lexical and functional morphemes will behave differently in repeated morph contexts, as just explained. In the worst case, the Parse and Faithfulness constraints might have to be split into more specific constraints that mention subcategories of features, or individual features in some extreme cases. It would take us too far afield to explore this issue here (but see below for more discussion on splitting constraints in this way).

## 2.3 Markedness

We now turn to another type of competion between a null form and an overt realization of an affix. In the relevant cases, the opposition between the two forms is used to mark certain properties of the syntax, in particular the markedness of particular phi-features in an object and/or subject. The phemonon can be observed with both case and agreement.

There is a substantive literature on what counts as a marked subject or object. In a seminal paper, Silverstein (1976) argues for a universal markedness hierarchy along the following lines:

(13) 1 > 2 > 3/proper noun > 3/human > 3/animate > 3/inanimate

A *subject* is *more* marked the lower its properties on this hierarchy. For example, any third person subject is more marked than a second or first person subject. In contrast, the lower the properties of an *object*, the *less* marked it is. Thus, a second person object is more marked than any third person one.

In some languages, morphological case is sensitive to the status of the subject or object with respect to the markedness hierarchy in (13). In particular, overt cases seem to be preferred for more marked arguments. In an absolutive-ergative case system, ergative tends to be overt; in a nominative-accusative case system it is the object case, accusative, that tends to be overt. In certain split case systems, then, marked subjects distinguish themselves from unmarked ones by carrying ergative case (rather than nominative, which does not show up morphologically). Similarly, marked objects carry accusative (rather than absolutive, which again has no morphological correlate). The answer to the question of what kind of subject is marked enough to warrant ergative case marking differs from language to language, as does the cut-off point for accusative marking on objects.

This variation amongst languages with a split-case system can be analyzed as involving competing forms, one of which is selected on the basis of a set of conflicting constraints – as in

OT-grammar, that is. A proposal along these lines is developed by Aissen (1999), who translates Silverstein's hierarchy into a set of constraints that require overt case marking for particular types of arguments. The more marked a feature combination for a particular type of argument, the more prominent the constraint requiring overt case for this argument. Thus, the following two constraint hierarchies obtain (where CM stands for 'case mark'):[6]

(14) a. CM [Subj, 3/inanimate] > CM [Subj, 3/animate] > CM [Subj, 3/human] > CM [Subj, 3/proper noun] > CM [Subj, 2] > CM [Subj, 1]

b. CM [Obj, 1] > CM [Obj, 2] > CM [Obj, 3/proper noun] > CM [Obj, 3/human] > CM [Obj, 3/animate] > CM [Obj, 3/inanimate]

Crucially, it must be assumed that the constraints in (14) cannot be reranked with respect to each other, which would give rise to language-particular rankings of them, since the essence of Silverstein's markedness hierarchy is that it is universal. The constraints can be reranked, however, with respect to a constraint that militates against the morphological realization of case. For this, Aissen adopts a very general constraint that penalizes structure (*Struc). The position of *Struc in the constraint hierarchies determines the cut-off point between case-marked and case-less subjects and between case-marked and case-less objects.

Note that in this system the marking of case for subjects and objects is in principle independent. That is to say, the ordering of the constraints in the hierarchy in (14a) with respect to the constraints in the hierarchy in (14b) has no effects. This independence means that the system may give rise to sentences with an Ergative-Accusative case pattern, namely when both the subject and the object classify as marked (the respective CM constraints mentioning their features both being ranked above *Struc). Languages with such patterns do indeed occur (see for instance Woolford 1997), but there are also languages in which such a case pattern seems to be disfavoured. Let us assume that there is a constraint which has the effect that only one argument in a transitive clause can be case-marked (OneCase). If such a constraint is sufficiently highly ranked, conflicts arise in case the subject and the object both have properties that would normally require case marking. In that case, the mutual ranking of the object and subject constraints becomes crucial. Suppose, for example, that the following ranking obtains:

(15) One-Case > CM[Obj, 3/human] > CM[Subj, 3/animate] > *Struc > CM[Obj, 3/animate] > CM[Subj, 3/human]

Given this constraint ranking, a third person animate subject will usually contrast with a third person human subject in being case-marked. However, when a third person human object is also present, this will require case marking as well, and given that CM[Obj, 3/human] outranks CM[Subj, 3/animate] while both are dominated by OneCase, this precludes case marking of the subject.

Further research is required to explore whether there are case systems that display these kinds of interactions. However, Trommer (2004) discusses an example of an agreement system in which subjects and objects compete for a single agreement slot on the verb in this way. The language in question, Dumi, favours agreement with arguments that have features that are higher on the following two hierarchies:

[6] We simplify the details of Aissen's proposal somewhat. She generates the constraints in (14) using a technique called local conjunction (due to Smolensky 1995). This does not affect the argumentation here.

(16) a. 1 > 2 > 3
b. Plural > dual > singular

Dumi does not seem to care whether agreement is with the object or the subject, although object agreement in certain circumstances requires that an additional marker be added (glossed as MS for 'marked scenario'). The effects of the person hierarchy in (16a) are illustrated in (17). The example in (17a) shows that a first person dual subject beats a second person dual object in the competition for agreement, where as (17b) shows that a first person dual object beats a second person dual subject.

(17) a. du:khuts-i
*see-1.DUAL*
'We (dual) saw you (dual)'
b. a-du:khuts-i
*MS-see-1.DUAL*
'You (dual) saw us (dual)

The examples in (18) illustrate the workings of the number hierarchy in (16b). Irrespective of grammatical function, a plural argument beats a dual argument in the battle for agreement.

(18) a. do:khot-t-ini
*see-NONPAST-3PL*
They (plural) see them (dual)'
b. do:khot-t-ini
*see-NONPAST-3PL*
'They (dual) see them (plural)

A situation can occur in which one argument qualifies better for agreement on one hierarchy, while the other is to be preferred on the basis of the other hierarchy, for example if one argument is first singular, while the other is third plural. We might expect that in such circumstances either the person hierarchy outranks the number hierarchy, or vice versa. However, as Trommer notes, the situation is more complex.

For a start, it often depends on the exact feature content of the arguments which hierarchy carries the most weight. In the case of a second person singular subject and an object that is third person dual or plural, it is the number hierarchy that prevails: agreement is with the object. On the other hand, if one argument is second person dual and the other third person plural, it the person hierarchy that is decisive: the chosen agreement marker is specified as second person dual. There is a way in which this pattern can be described using the kind of constraints proposed by Aissen (see above). The idea would be to formulate a separate agreement-demanding constraint for every possible combination of person and number features, and to rank all these constraints in the appropriate order under the constraint that rules out double agreement (call it OneAgr).

Trommer shows, however, that there is a phenomenon in Dumi that excludes such an account. As it turns out, there is one case in which conflicting demands arising from the person and number hierarchies are reconciled by having more than one agreement marker after all. The

crucial example involves a first person singular argument and an argument specified as second or third person and as dual or plural:

(19) a. do:khot-t-e-ni
*see-NONPAST-1SG-3PL*
'I see them (plural)'
b. a-du:khus-t-e-ni
*MS-see-NONPAST-1SG-3PL*
'They (plural) see me'

This situation cannot be described in terms of reranking OneAgr with respect to constraints that require the spell-out of certain feature combinations. One might think that (19) can be accounted for by ranking both R(ealize)[1sg] and R[3pl] above OneAgr. This will lead to a ranking paradox, however, since there are contexts in which at least third person plural does not give rise to agreement, apparently as a consequence of OneAgr. In particular, consider the situation in which a third person plural argument competes with a second person dual argument. As noted above, there is only one agreement marker in this case, for the second person argument. This implies that R[3pl] must be ranked below OneAgr, in direct contradiction to the initial suggestion.

Trommer shows that the agreement patterns of Dumi can be captured by an OT-analysis, but that they require context-sensitive constraints of the type "Realize agreement for feature $F_1$ *in the presence of* $F_2$" (where $F_1$ is more prominent than $F_2$ on the same markedness hierarchy). Ranking such constraints (with respect to each other and with respect to a constraint like OneAgr) does give rise to a consistent grammar for Dumi. We refer to Trommer's work for details, but it is not difficult to see why this works: (19) indicates that both 'Realize 1 in the presence of 3' and 'Realize plural in the presence of singular' are ranked above OneAgr. The suppression of 3rd plural in the presence of second person dual indicates that the grammar must also have a partial constraint ranking such that 'Realize plural in the presence of dual' is ranked below both 'Realize 2 in the presence of 3' and OneAgr. These two partial constraint rankings can be combined into a single ranking without this leading to a ranking paradox.

*3. Competition between components*

3.1 Elsewhere cases

As we have seen, the basic case of competition in morphology can be characterized by the Elsewhere Principle: a more specific form is preferred over a more general one where both are in principle grammatical. By definition, competitors are those forms that can be used to express the same concepts. It is possible, therefore, that competing structures are generated in different components, in particular morphology and syntax.

A well-known example involves the English comparative affix *–er*, which must attach to short (maximally bisyllabic) adjectives (see (20a,b)). This morpheme is in competition with the syntactic modifier *more*, which can in principle attach to both short and long adjectives, and is therefore the more general form. In the context of short adjectives, the Elsewhere Principle dictates that *-er* blocks *more* (see (20c,d)). (We add (20e) to show that in circumstances where the Elsewhere Prinicple does not apply *more* can indeed modify short adjectives.)

(20) a. Bigger
b. *Intelligenter
c. *More big
d. More intelligent
e. Bigger means ‘more big’

This classical application of the Elsewhere Principle demonstrates that a morphological complex can be in competition with a syntactic phrase. However, the effects of the Elsewhere Principle are not limited to morphology blocking syntax. As pointed out by Williams (1997), there are also cases in which the Elsewhere Principle operates within syntax. For one thing, the Minimal Link Condition (Chomsky 1995) can be seen as an instance of blocking. Because a lower landing site can attract a subset of the elements that a higher landing site can attract, it is, in this sense, more specific than the higher one. Consequently, movement to a higher landing site is blocked where movement to the lower landing site is possible. More relevant in the present discussion are cases in which, as opposed to the one in (20), the specific form is syntactic and the general form morphological. The English simple past, for instance, is morphological. Yet, in the perfect, it is blocked by a syntactic periphrastic construction, which is more specific as it roughly expresses past with present relevance.

Another case of competition in which a more specific syntactic construction blocks a more general morphological form concerns the negated form of the first person singular of the verb *to be*, as discussed by Bresnan (1999) (the account below is somewhat simplified and involves a slightly different interpretation of the data as compared to Bresnan’s account). Normally, a sentence with a finite form of *to be* can be negated by morphological means, namely by adding *n’t* to the verb (see Zwicky & Pullum 1983 for arguments that *n’t* is an affix). There is a gap in the paradigm of these negative forms, however: *n’t* cannot be added to first person singular *am*:

(21) a. *I amn’t working
b. you aren’t working
c. s/he isn’t working
d. we aren’t working
e. you aren’t working
f. they aren’t working

If the Elsewhere Principle could only compare morphological forms, we may expect that, given the absence of the specific form *amn’t*, the more general form *aren’t* is used. In inversion contexts, this is indeed the form that occurs:

(22) a. *Amn’t I working
b. Aren’t I working

It is important to realize that, in addition to the forms in (21) and (22), English allows a syntactic realization of negation that *is* compatible with (*a)m*:

(23) I’m not working

This syntactic combination of *am* and *not* expresses the concept “negation of the first person singular of *be*” more accurately than the more general *aren’t*, and will hence block the latter if

the Elsewhere Principle applies across components. We see this happening in sentences without inversion: (24) is blocked by (23).

(24) *I aren't working

The question, then, is why inversion should have an effect on the realization of the negated first person of *be*. Since inversion is an operation of head movement (Aux-to-C movement), it must strand nonaffixal negation. This rules out (25a) (in OT terms, GEN cannot generate (25a), hence this will never be a candidate structure). The only potential competitor left for (22b) then is (25b). According to Bresnan, this structure does not actually have the right semantics to be in competition with *Aren't I working*, as the scope of negation is limited to the VP in (25b), while the interpretation we are interested in involves sentential negation.

(25) a. *Am not I working
b. Am I not working

The situation again lends itself well to an OT-analysis, by using two Parse-type constraints in addition to the ban on *amn't* (which might follow from some more general phonological constraint, an issue we will ignore here). The analysis is in the same spirit as Bresnan's, although different in execution.

Following Bresnan, we assume that there is a constraint according to which the semantic scope of negation must be mirrored by overt syntax (say NegScope). For constituent negation, this means that the negator should appear adjoined to the constituent in question; for sentential negation, this constraint demands that the negator must appear as high in the clause as possible (the more structure dominates the sentential negator, the more this constraint is violated). In negated declaratives, candidates with affixal negation (such as *I aren't working*) are as good on this constraint as candidates in which *not* is adjoined to VP (such as *I'm not working*), as in both cases the amount of structure dominating the negator is the same (the projections of Infl and higher). In negated interrogatives, candidates with affixal negation score better on NegScope than candidates with *not,* however. This is because full negation must be stranded under verb movement to C (as *not* does not form a constituent with the verb, but is adjoined to VP), while affixal negation is taken along, thereby ending up being dominated by less structure than its *not* rival in this case.

The other relevant constraint is familiar from section 2.2: it is the constraint that requires phi-features in the input to be properly realized. As will be clear, sentences with *am not* are a better spell out of "first-person negative *be*" than sentences with more general *aren't*.

The data from (standard) English described above fall out from the constraint ranking *Amn't >> NegScope >> ParsePhi, as the following tableaux demonstrate:

(26)

| <declarative> | *Amn't | NegScope | ParsePhi |
|---|---|---|---|
| I [amn't] working | *! | | |
| ☞ I am [not working] | | | |
| I [aren't] working | | | *! |

(27)

| <interrogative> | *Amn't | NegScope | ParsePhi |
|---|---|---|---|
| [Amn't] I working | *! | | |
| Am I [not working] | | *! | |
| ☞ [aren't] I working | | | * |

Note that *Am I not working* is not ungrammatical. Although it cannot express sentential negation, it is the optimal candidate for constituent negation of *working*.

3.2 Competition between modules that does not involve the Elsewhere Principle

In the previous subsection we discussed how Elsewhere-style competition can apply across components. In the current subsection we will discuss the possibility that morphology and syntax compete in the generation of structure, even if the Elsewhere Principle does not apply. In particular we will make a case for the idea that when a syntactic phrase and a morphological construct can express the same input equally well, the syntactic option blocks the morphological one, at least in languages like English.[7]

Consider the way in which the semantic relation between a predicate and its direct argument can be realized structurally. One obvious possibility is to combine them syntactically, giving rise in the case of a verb to a standard transitive verb phrase. A perhaps less obvious, but logically equally available, option is to form a root compound. After all, the semantic relation between the two members of a root compound is not inherently restricted, and could therefore subsume the predicate-argument relation. It is, therefore, surprising that this type of root compound is systematically absent. The VP in (28a) does not alternate with the N-V compound in (28b).

(28) a. to [$_{VP}$ drive [$_{NP}$ trucks]]
b. *to [$_{V}$ truck$_{N}$ drive$_{V}$ ]

The pattern is more general: root compounds in general cannot have a transparent semantics. Thus, the structure of prenominal modification in Dutch (29a) does not alternate with the A-N compound in (29b).

(29) a. [$_{NP}$ [$_{AP}$ blauwe] ogen$_{N}$ ]
*blue-DECL eyes*
b. [$_{N}$ blauw$_{A}$ ogen$_{N}$ ]

This cannot be due to a lack of N-V compounding in English or A-N compounding in Dutch. Both are in fact fairly productive. (30) and (31) give lists of examples that can easily be extended.

(30)

| | | |
|---|---|---|
| to breast-feed | to hand-make | to baby-sit |
| to play-act | to air-condition | to bar-tend |
| to window-shop | to c-command | to pressure-clean |
| to base-generate | to chomsky-adjoin | to pan-fry |
| to head-adjoin | to head-govern | to carbon-date |

[7] An extended version of the argument can be found in Ackema & Neeleman 2004.

(31)

| | |
|---|---|
| zoet-hout | speciaal-zaak |
| *sweet-wood* | *special-shop* |
| 'liquorice' | 'specialist shop' |
| zwart-boek | bruin-vis |
| *black-book* | *brown-fish* |
| 'blackbook' | 'porpoise' |

These examples show that the semantics of root compounds varies wildly, but in no case does the compound have a transparent compositional semantics.

Interestingly, argument-predicate relationships and transparent modifier-head relationships *can* sometimes hold between parts of words. In particular, synthetic compounds can express such relationships as a matter of course:[8]

(32) a. $[_N\ [_V\ \text{truck}_N\ \text{drive}_V\ ]\ \text{er}_N\ ]$
b. $[_A\ [_N\ \text{blauw}_A\ \text{oog}_N\ ]\ \text{ig}_A\ ]$
*blue eye ed*

This state of affairs can explained in terms of competition between syntax and morphology on the following assumption:

(33) Syntactic merger of (a projection of) α and (a projection of) β blocks morphological merger if the semantic relation between α and β is identical in the two cases.

(33) immediately explains why morphological merger of a verb and its direct object is blocked: a syntactic competitor is always available. The same holds of structures of prenominal modification.

At the same time, the synthetic compound in (34a) is allowed to coexist with its syntactic counterpart in (34b). The point is that in (34b) *truck* merges with a projection of *-er*, while in (34a) it merges with a projection of *drive*. As a result, one cannot say that (projections of) the same categories merge in the two cases in (34). Hence, given (33), competition does not obtain.

(34) a. $[_N\ [_V\ \text{truck}_N\ \text{drive}_V\ ]\ \text{er}_N\ ]$
b. $[_{NP}\ [_N\ \text{drive}_V\ \text{er}_N\ ]$ (of) $[_{NP}$ trucks$]]$

This result crucially relies on *–er* being a projecting affix, that is, an affix that is the head of the morphological complex it derives. Of course, we can also combine *drive* with an affix and project *drive*, rather than the affix. In such a case synthetic compounding is predicted to be impossible, since *truck* now again merges with a projection of *drive*, just as in the syntactic competitor. Therefore, (35a) blocks (35b)

[8] The argument given in this section relies on the structure of synthetic compounds being as indicated in (32). For argumentation that the alternative right-branching structure cannot express the meaning of a synthetic compound, see Ackema & Neeleman 2004.

(35) a. John [$_{VP}$ [$_{V}$ drive$_{V}$ s$_{I}$ ] [$_{NP}$ trucks]]
b. *John [$_{V}$ [$_{V}$ truck$_{N}$ drive$_{V}$ ] s$_{I}$ ]

The nontransparent root compounds in (30) and (31) are grammatical, as they do not have a syntactic counterpart in which the same projections merge either. To give an example, *to pan-fry* does not mean the same thing as *to fry pans*, but rather the same thing as *to fry in a pan*. But in the latter case, *fry* merges with a projection of the preposition *in*, and not with a projection of the noun *pan*. This syntactic phrase is therefore not in competition with *to pan-fry*.

The kind of competition characterized by (33) can trivially be modelled in OT. The account would be based on two constraints, namely more specific instantiations of the more general *Struc (see section 2.3): *MorphStruc and *SynStruc, which militate against morphological and syntactic structure, respectively. In English the former must outrank the latter. It is, at this point, an open question whether these constraints are rerankable. Possibly, ranking *SynStruc above *MorphStruc gives rise to polysynthetic languages.

*4. Competition between different morpheme orders*

The examples of purely morphological competition discussed in section 2 all involve candidates that differ in the morphemes they use to spell out a morphosyntactic input. In this section we consider cases of competition in which candidates differ not in the morphemes they contain, but rather in the order in which these morphemes show up.

As a point of departure we may take a constraint that disfavors 'crossing correspondences' between morphosyntactic and morphophonological structures (see Marantz 1984 and Sproat 1985). In derivational morphology, for example, there usually is a one-to-one, left-to-right mapping of morphosyntactic positions to the phonemes that realize them. Thus, an input like (36a) (with the semantics "something that is like a mini computer") is realized as in (36b), not as in (36c). An input like (37a) (with the semantics of a "something small that is like a computer") is realized as (37c), rather than (37b)

(36) a. [PSEUDO [MINI COMPUTER]]
b. /pseudo/ /mini/ /computer/
c. */mini/ /pseudo/ /computer/

(37) a. [MINI [PSEUDO COMPUTER]]
b. */pseudo/ /mini/ /computer/
c. /mini/ /pseudo/ /computer/

The constraint regulating this mirroring effect (compare Baker 1985) can be formulated as in (38) (adapted from Sproat 1985:82). (As in (36) and (37), morphosyntactic positions are represented in capitals, while corresponding morphophonological units appear in lower case and between slashes.) Note that without Linear Correspondence, random affix ordering would be the norm.

(38) *Linear Correspondence*
If X is structurally external to Y,
X is phonologically realized as /x/, and
Y is phonologically realized as /y/
then /x/ is linearly external to /y/.

4.1 Conflicts between Linear Correspondence and templatic requirements

The constraint in (38) may seem trivial. But it turns out that there can be conflicting constraints on affix ordering that lead to an intransparent ordering of morphemes. An instance of this is discussed by Hyman (2003). It concerns the ordering of certain postverbal suffixes in Bantu languages, namely those affixes that express operations that change argument structure. Consider combinations of causative and applicative morphology (the applicative marks an operation by which instruments and the like are promoted to direct argument). Presumably, the morphosyntactic structures of a causative applicative and an applicative causative are distinct, with the causative affix c-commanding the applicative affix in the former, while being c-commanded by the applicative affix in the latter. Linear Correspondence requires that these structural relations are reflected by morpheme order in the morphophonology:

(39) a. [[V APPLICATIVE] CAUSATIVE] □
b. [[/v/-/applicative/]-/causative/]

(40) a. [[V CAUSATIVE] APPLICATIVE] □
b. [[/v/-/causative/]-/applicative/]

There are various languages that are well behaved in this respect, so that the applicative and causative markers used to express sentences like "he made the children cry with a stick" (with *stick* being promoted to direct argument by applicative) and "he made the children stir with a spoon" (with *spoon* being promoted to direct argument by applicative), respectively, show up in different orders, as in the former applicative has applied to an instrument of causation (i.e. applicative applies after causativization), while in the latter it has applied to an instrument of *stir* (i.e. applicative applies before causativization). Surprisingly, however, one can also find languages that use the same morpheme order to express the structures in (39a) and (39b). Consider the following data from Chichewa (see Hyman 2003; for general discussion of Chichewa morpheme order, see Hyman & Mchombo 1992):

(41) a. Alenjé a-ku-líl-**íts-il**-a mwaná ndodo
*hunters 3PL-PROG-cry-CAUSE-APPL-FV child sticks*
'The hunters are making the child cry with sticks'
b. Alenjé a-ku-tákás-**its-il**-a mkází mthíko
*hunters 3PL-PROG-stir-CAUSE-APPL-FV woman spoon*
'The hunters are making the woman stir with a spoon'

Both the applizativized causative in (41a) and the causativized applicative in (41b) have the same order of the *íts* (causative) and *íl* (applicative) affixes. According to Linear Correspondence, the order should be reversed in (41b). Apparently, there a constraint that overrules Linear

Correspondence in this example. Hyman argues that all Bantu languages want their postverbal derivational morphemes to occur in a specific order, expressed by the following template:

(42) *Pan-Bantu Template* (CARP)
Causative-Applicative-Reciprocal-Passive

If CARP is ranked over Linear Correspondence, a violation of the mirror principle can result:

(43)

| <[[V APPLICATIVE] CAUSATIVE]> | CARP | Linear Correspondence |
|---|---|---|
| [[/v/-/applicative/]-/causative/] | *! | |
| ☞ [[/v/-/causative/]-/applicative/] | | * |

Reranking the two constraints leads to instances where the template is sacrificed in order to express the scopal relation between the morphemes overtly:

(44)

| <[[V APPLICATIVE] CAUSATIVE]> | Linear Correspondence | CARP |
|---|---|---|
| ☞ [[/v/-/applicative/]-/causative/] | | * |
| [[/v/-/causative/]-/applicative/] | *! | |

There is, indeed, language variation in Bantu concerning the extent to which the template is adhered to. This is not a matter of either following the template completely, or complying with Linear Correspondence completely. Within a single language, the choice made can differ for any individual pair of derivational affixes. For example, whereas the order of applicative and causative morphemes in Chichewa adheres to the CARP template, the order between applicative and passive morphemes is determined by Linear Correspondence, with the consequence that in an applicativized passive, the postverbal CARP template is violated. This type of variation requires that either the template or Linear Correspondence is split into a family of constraints mentioning pairs of morphemes. Hyman chooses to split his version of Linear Correspondence in this fashion, since in his view violations of the template are the exception, rather than the rule (but see below).

An OT-type analysis along these lines makes two predictions. The first is that, although violations of Linear Correspondence are possible, they are not random: they must be forced by the template. This implies that if a particular morpheme order is favoured by both constraints, the opposite order should never be found in any language (it is harmonically bounded). The following tableau shows this for applicativized causatives:

(45)

| <[[V CAUSATIVE] APPLICATIVE]> | CARP | Linear Correspondence |
|---|---|---|
| [[/v/-/applicative/]-/causative/] | *! | * |
| ☞ [[/v/-/causative/]-/applicative/] | | |

Hyman shows that morpheme order variation that would go against both the template and Linear Correspondence is indeed absent.

The second prediction is a little more involved. If either CARP or Linear Correspondence is to be split into constraints mentioning pairs of morphemes, the following situation can arise. Suppose that there is a template that favours a morpheme order /a/-/b/-/c/, and that is split into three constraints P(recede)[/a/-/b/], P[/a/-/c/] and P[/b/-/c/], plus a general Linear Correspondence

principle. This set-up can have the surprising result that two morphemes that are not adjacent in the template can occur in one order when separated by a third morpheme, but in the alternate order when adjacent. This follows from the constraint ranking P[/a/-/b/] > P[/b/-/c/] > Linear Correspondence > P[/a/-/c/]. Consider an input with A taking scope over C and B taking scope over A. As the following tableau shows, the phonological output will be the one that completely complies with the /a/-/b/-/c/ template:

(46)

| < … C] A] B] > | P[/a/-/b/] | P[/b/-/c/] | Linear Correspondence | P[/a/-/c/] |
|---|---|---|---|---|
| ☞ /a/-/b/-/c/ | | | * | |
| /a/-/c/-/b/ | | *! | * | |
| /b/-/a/-/c/ | *! | | * | |
| /b/-/c/-/a/ | *! | | * | * |
| /c/-/a/-/b/ | | *! | | * |
| /c/-/b/-/a/ | *! | * | * | * |

Consider next what happens if B is omitted from the input:

(47)

| < … C] A] > | P[/a/-/b/] | P[/b/-/c/] | Linear Correspondence | P[/a/-/c/] |
|---|---|---|---|---|
| /a/-/c/ | | | *! | |
| ☞ /c/-/a/ | | | | * |

Comparing (46) with (47), we see that the order of /a/ and /c/ has switched in the two cases. This kind of 'morpheme metathesis' does indeed occur in languages with a (partially) templatic morphology (see Spencer 1991:210ff).[9]

It is further predicted that morpheme metathesis will never affect morphemes that are adjacent in the overall template. This is because for such morpheme pairs the mutual ranking between the precedence constraint mentioning them and Linear Correspondence will determine their order in every context, as precedence constraints mentioning only one of these morphemes and another morpheme cannot interfere in this case. To the best of our knowledge, there are indeed no languages in which, say, /a/-/b/-/c/ coexists with /c/-/b/ or /b/-/a/.[10]

4.2 Conflicts between Linear Correspondence and other correspondence constraints

As we have seen, Linear Correspondence favors a particular ordering of phonological affixes (or /affix/es). Another, potentially conflicting, mapping principle states which hosts an /affix/ can attach to. So far, we have implicitly assumed that any host with which the /affix/ can form a

[9] A comparable phenomenon can be found in English syntax. Bobaljik (2000) shows that there are triples of adverbs occurring in a fixed order that can be broken when only the highest and lowest adverb appear.

[10] Notice that this analysis assumes that the template, rather than Linear Correspondence, is broken up into smaller constraints. It is possible to achieve the same result by splitting Linear Correspondence, but this is somewhat more involved (as it requires the assumption that the order encountered when all affixes are present is in fact not the one that is completely in compliance with the template). In principle, the choice between the two approaches is empirically testable, namely by considering which of the orders (the one with all affixes present or the one with an affix absent) satisfies Linear Correspondence. We cannot go into this here.

phonological word will do. In reality, however, an /affix/ usually combines with the phonological correspondent of the head of the category that the morphosyntactic affix (call it AFFIX) combines with. This condition, formulated in (48), is equivalent to Sadock's (1991) Strong Constructional Integrity.

(48) *Input Correspondence*
If an AFFIX selects (a category headed by) X,
the AFFIX is phonologically realized as /affix/, and
X is phonologically realized as /x/,
then /affix/ takes /x/ as its host.

If the AFFIX selects a simplex category X, the effect of Input Correspondence is trivial: /x/ and the /affix/ form a phonological word. In case the AFFIX selects a more complex structure, (48) demands that the corresponding /affix/ forms a phonological word with the phonological realization of the head of that structure, rather than anything else. In other words, Input Correspondence favors a mapping of the left-branching morphosyntactic structure in (49a) onto the right-branching morphophonological structure in (49b).

(49) a. $[[_X$ Y X] AFFIX] ↔
b. [[/y/ [/x/ /affix/]]

Mappings of the type in (49) provide an alternative to what Hoeksema (1984) characterizes as 'head operations', morphosyntactic operations which affect the properties of a complex category by (apparently) applying to its head.

The effects of Input Correspondence become particularly clear when we consider cases in which it conflicts with Linear Correspondence. An example is provided by structures in which a complex left-headed category is selected by an AFFIX that is spelled out by a /suffix/ (see (50a)). For such structures, Linear Correspondence would favor mapping to (50b), whereas Input Correspondence would favor mapping to (50b').

(50) a. $[[_X$ X Y] AFFIX] ↔
b. [/x/ [/y/ /affix/]]
b'. [[/x/ /affix/] /y/]

This means that in general morphosyntactic representations like (14a) cannot be mapped onto a morphophonological form without violating at least one mapping principle. Consider, from this perspective, the case of left-headed Italian compounds. Some examples are given below:

(51) a. carta regalo
*paper gift*
'wrapping paper for presents'
b. carta carbone
*paper carbon*
'carbon paper'

These compounds resist further word formation with most, if not all, derivational suffixes. Although *carta* can be derived by *-iere*, *-aio*, and *-ista* (see (52)), the forms in (53) and (54) are all ungrammatical (Vieri Samek-Lodovici, personal communication).

(52) a. cart-iere
'paper seller'
b. cart-aio
'paper worker'
c. cart-ista
'paper specialist'

(53) a. *carta regal-iere
a'. *cart-iere regalo
b. *carta regal-aio
b'. *cart-aio regalo
c. ??carta regal-ista
c'. *cart-ista regalo

(54) a. ??carta carbon-iere
a'. *cart-iere carbone
b. ??carta carbon-aio
b'. *cart-aio carbone
c. ?carta carbon-ista
c'. *cart-iste carbone

An OT analysis of such 'absolute ungrammaticality' may rely on the inclusion of the null parse in the candidate set (see section 2.2), in conjunction with two constraints, one requiring the realization of morphemes, the other militating against partial realization of words. We will not demonstrate this here.

Interestingly, languages can specify that the realization of particular suffixes is favoured to such an extent that even left-headed compounds derived by them are allowed to surface. In the case of Italian, this is true of the plural (and perhaps also the diminutive). A morphosyntactic structure [[$_N$ N X] PLURAL] is mapped onto a morphophonological representation at the cost of violating some mapping principle. There is a clear preference to sacrifice Linear Correspondence, rather than Input Correspondence, suggesting a ranking Parse[PLURAL] >> Input Correspondence >> Linear Correspondence:

(55) a. cart-e regalo
*paper*-PL *gift*
'pieces of paper for wrapping presents'
a'. *carta regal-i
*paper gift*-PL
b. cart-e carbone
*paper*-PL *carbon*
'carbon papers'

b'. *carta carbon-i
*paper carbon*-PL

This preference is language-specific. As Scalise (1988) notes, Somali has left-headed compounds which are inflected on the second constituent (the nonhead). This suggests that in Somali Linear Correspondence outranks Input Correspondence.

As in the Bantu languages, there will be no language variation for those cases for which there is a candidate complying with all constraints. With respect to pluralization of compounds, we know of no languages in which a right-headed compound is marked for plural by a suffix on the left-hand constituent (the nonhead), a situation which would involve gratuitous violations of both Input Correspondence and Linear Correspondence. Compare Scalise's (1988) typological schema for inflected compounds:

(56) a. head to the right; inflection to the right (occurs in English, Italian and Somali)
b. head to the left; inflection to the left (occurs in Italian)
c. head to the left; inflection to the right (occurs in Somali)

The missing option is indeed 'head to the right; inflection to the left'.

On at least one interpretation of Linear Correspondence and Input Correspondence, it seems that the input in (50a) can in fact be mapped without violating either. Suppose that the affix is spelled out twice, both on the head and linearly external to the phonological correspondent of the left-headed compound:

(57) a. $[[_X$ X Y] AFFIX] ↔
b. [[/x/ /affix/] [/y/ /affix/]]

If the mapping principles in (38) and (48) require that *some* spell-out of the affix occupies the relevant position in the morphophonology, (57b) satisfies both of them. Indeed, such double realizations occur. Scalise (1988) gives the example in (58a,b); similarly, *carta carbone* marginally allows (58c) as a plural.

(58) a. mezza notte
*middle night*
'the middle of the night'
b. mezz-e nott-i
*middle*-PL *night*-PL
c. ?cart-e carbon-i
*paper*-PL *carbon*-PL

However, given that the pattern in (58) is not the only one attested, there must also be a mapping principle that is violated by multiple phonological realization of a single affix. This is stated in (59) (which is equivalent to Noyer's (1993) Uniqueness principle):

(59) *Quantitative Correspondence*
No element in the morpho-syntax is spelled out more than once.

Quantitative Correspondence is independently motivated by the simple fact that, in the absence of conflicting requirements, affixes are not normally spelled out more than once. Thus, [/read/ /able/ /able/] does not exist alongside [/read/ /able/].

Although the above data are suggestive of an OT treatment, they also present a challenge to the framework. This is because one and the same morphosyntactic input (PLURAL) is realized differently depending on the specific compound it is attached to (compare *mezza notte* with double plural marking versus *carte regalo* with plural affix only on the head). In order to capture such a pattern, one would have to assume a different ranking of the constraints for different pluralized compounds. The possibility that constraint rankings can vary for individual words and morphemes has been explored in optimality-theoretic implementations of lexical phonology, but the disadvantages of the approach are clear. In its extreme form, it would lead to rote learning.

The problem repeats itself in a more severe form in English. Subject names derived from particle verbs can surface in three ways, each of them violating one of the mapping principles discussed above (see Yip 1978 and Sproat 1985):[11]

(60) a. truck filler upper
b. passer by
c. comeouter

For more discussion on the interplay between the various mapping constraints, see Ackema & Neeleman 2004.

*5. Conclusion*

It does not seem too much to say that one of the core phenomena of morphology, and perhaps of grammar in general, is that one form can compete with, and hence block, others. The classical cases of such competition involve inflectional morphology as regulated by the Elsewhere Principle. In this contribution, we have argued that there are many more examples of competition, which differ from the classical case in terms of the nature of the candidates and the selecting constraints. It seems to us that OT is the natural framework within which to explore morphological competition, although, as we have seen, there are some recalcitrant data.

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[11] There is a clear statistical difference between the three patterns: the first is more frequent than the second, while the third only occurs sporadically.

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