

Morphology –like syntax– is in the eye of the beholder^{*}

Joost Kremers
University of Göttingen, Germany
joost.kremers@phil.uni-goettingen.de

July 4, 2011

1 Introduction

The distinction between syntax (phrasal structure) and morphology (word structure) is well established in both descriptive and theoretical linguistic thinking. Even though there are various proposals in the linguistic literature that argue for eliminating the distinction (e.g., Selkirk 1982, Lieber 1992, Ackema 1995, Siebert 1999, Halle & Marantz 1993, etc.), none of these can really escape the distinction between word structure and phrasal structure and must make special arrangements in its syntactic model to accommodate word structure and the properties that set it apart from phrasal structure.

In this paper, I argue that the idea behind proposals to unify syntax and morphology is essentially correct: there is indeed only a single computational system combining abstract symbols into larger structures. The empirical differences between word structure and phrasal structure that we observe in linguistic forms, and which are the reason why the authors mentioned in the previous paragraph all need to assume special syntactic operations that cater specifically to word structures, should, I believe, be explained through the interaction of syntax with phonology.

Put differently, I claim that the distinction between morphology and syntax is essentially an optical –or rather, acoustic– illusion: it is not the structure-building mechanism that determines whether a given structure is morphological or syntactic, rather it is the phonological structure of the form onto which the output of the structure-building computation is mapped that lets us *perceive* a given structure as morphological or syntactic.

Correspondence effects between syntax and semantics strengthen this effect. For reasons to be discussed below, there is a strong tendency in language to express concepts (i.e., basic units

^{*}Parts of the research reported on in this paper were funded by the German Research Foundation (DFG), grant number GR 559/8-1.

of semantic computation) as prosodic words. As a result, it appears as if the grammar treats words differently from phrases, but in fact, the same principles underlie both domains.

One consequence of the proposal is that certain generalisations and constraints that we observe in language are imposed by external systems. These include restrictions placed on the grammar by the modality in which it is expressed (e.g., the requirement of linearity), restrictions imposed by the parser (e.g., recoverability of the base position of a displaced element, cf. also Abels & Neeleman 2009). Other generalisations and constraints result from the correspondence between semantic and syntactic structure and between syntactic and phonological structure.

While the latter type of restriction can still be considered grammatical, since the mapping between semantics, syntax and phonology is part of grammar in the broad sense, the former type of restriction is not grammatical. They fall in the category that Chomsky has called interface effects or third-factor effects (i.e., from “principles of structural architecture and developmental constraints that are not specific to the organ under investigation, and may be organism-independent” Chomsky 2008: 133) or the Faculty of Language in the Broad sense (FLB, Hauser et al. 2002). They do not constrain the grammar of an I-language directly, rather they constrain the development of an I-language.¹

2 Syntax-morphology synthesis

Lieber (1992: 21) states that:

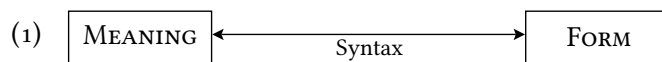
[t]he conceptually simplest possible theory would (...) be one in which all morphology is done as a part of a theory of syntax (...) A truly simple theory of morphology would be one in which nothing at all needed to be added to the theory of syntax in order to account for the construction of words.

It is certainly true that the most elegant theory possible would not distinguish between a syntax module and a morphology module. There are, in fact, several other conceptual reasons for preferring a theory with a unified syntax-morphology module. Even though none of these arguments is really fatal to a two-module theory, they do show that if we are able to formulate a unified theory that is not less elegant than a two-module theory, we should prefer the unified theory.

2.1 Form-meaning pairing

The idea that language is form with a meaning goes back to Aristotle. The individual signs (the forms) have a particular meaning, but when signs are combined, it is the syntactic structure that links the form of such a combination to its meaning. Syntax, in this view of language, is the glue that mediates the pairing of form (phonology) and meaning (semantics). We can visualise this situation as in (1):

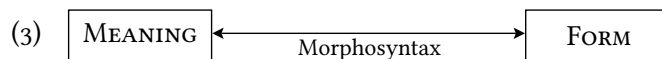
¹And in evolution they may have constrained UG, although that is mere speculation.



Interestingly, we can repeat the previous paragraph, replacing the word “syntax” with “morphology”: The idea that language is form with a meaning goes back to Aristotle. The individual signs (the forms) have a particular meaning, but when signs are combined, it is the morphological structure that links the form of such a combination to its meaning. Morphology, in this view of language, is the glue that mediates the pairing of form (phonology) and meaning (semantics). We can visualise this situation as in (2):



What this means is that from a bird’s eye view, syntax and morphology perform the same function: they link form to meaning. From such a perspective, it seems strange to even assume there should be two different modules. It would make much more sense to have just one module responsible for both word structure and phrasal structure:



I will refer to the single morphology/syntax module as “morphosyntax” or simply “syntax”. The obvious bias toward syntax in this nomenclature should not be taken as an indication that syntax is more important than morphology. It is simply the case that given the conventional connotations of these words, “syntax” more easily generalises to a hyperonym than “morphology”.

2.2 Distinguishing structures

In traditional terms, the difference between morphology and syntax lies in the kinds of structures that they deal with: morphology operates below the word level, syntax operates from the word level upwards. The problem with such a definition of the distinction is that the term “word” is not defined. Syntax deals with heads, not with words, but we cannot say that morphology “operates below the head”, because the standard view is that morphology operates on heads as well. Many of the heads that syntax deals with are realised overtly as affixes or merely as features of some word form (e.g. Infl or T/Asp in Germanic, Romance, Slavic, etc., C in languages with clitic complementisers, D in languages with clitic determiners, K (or Case) in languages with overt case morphology, etc.)

That is not to say that there have not been attempts to treat morphology as ‘sub-head’ syntax. Ackema (1995) argues that morphological structures should be analysed within X-bar theory as projections of negative X-bar levels, i.e., projections from X^{-2} to X^0 . Similar proposals are found in Selkirk (1982), who proposes a distinction between X° and X^{Af} elements, and Lieber (1992), who argues that X-bar theory should be extended with a recursive projection rule at the X° -level of the form $X^\circ \rightarrow X^\circ$.

The general problem with such proposals is that even though they claim to do away with the distinction between syntax and morphology, they reintroduce the same distinction by adopting

special constraints and principles in the syntactic component that only apply to word-level structures. Negative X-bar levels, or a recursive X° level are nothing more than morphological structures in a “syntactic” jacket.²

The very influential theory of Distributed Morphology (Halle & Marantz 1993 and much subsequent work) also assumes “syntactic structure all the way down”, i.e., morphological structures are essentially syntactic. However, even though DM does not assume a separate morphology module, there are still a number of so-called “morphological operations” such as fission, fusion, impoverishment and merger. In other words, it suffers from the same problem: the syntax has to be augmented with a special set of operations that deal with word-level structures.

For Ackema & Neeleman (2004, 2007) this fact is an important reason for assuming that there is a separate morphology module. However, such an approach has to answer the question which structures are generated by the morphology module and which by the syntax module. Intuitively, it is not difficult to distinguish between words and phrases in most cases. But as Haspelmath (2011) shows, there is no general, cross-linguistical property that distinguishes words from phrases and our intuitions in this regard are all too often shaped by our writing system.

This is not to say that there have been no attempts at defining the notion “word” in the literature. One attempt is made by Embick & Noyer (2001), working within the framework of Distributed Morphology. Embick & Noyer’s proposal captures what most would probably consider the most straightforward and intuitive way of defining the word. Specifically, Embick & Noyer define two notions, the *Morphological Word* and the *Subword*:

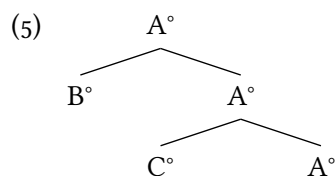
(4) a. *Morphological Word*:

At the input to Morphology, a node X° is (by definition) a morphosyntactic word (MWd) iff X° is the highest segment of an X° not contained in another X° .

b. *Subword*:

A node X° is a subword (SWd) if X° is a terminal node and not an MWd.

The problem with this definition is that it presupposes that we are able to tell when a specific node in the tree is “the highest segment of an X° not contained in another X° ”. This, however, is only possible by stipulation. The kind of structures that Embick & Noyer have in mind is represented in (5):



Here, the idea is that the top A° node corresponds to a word. However, in a framework that adopts Beard’s (1988) *Separation Hypothesis*, which DM does in the form of *Late Insertion*, there is no way to determine on the basis of the syntactic tree which nodes are X° nodes and

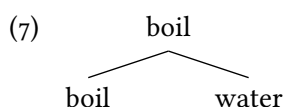
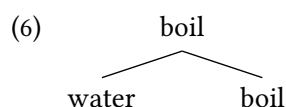
²Cf. Siebert (1999) for a similar argument.

at which point an X° projects into an X' . That is, there is one way to do this, Chomsky's (1995) Bare Phrase Structure, but with structures such as in (5), it yields the wrong results for Embick & Noyer's definition.

In Bare Phrase Structure, an X° category is a minimal projection, i.e., a piece of structure that is not projected from another element (in other words, not composed by Merge). Similarly, a maximal projection is the highest node in a projection line. For the structure in (5), this means that B and C are indeed X° categories, and so is the *lowest* A node. But the other two A nodes are non-minimal, i.e., they are *not* X° categories. The highest A node could in fact be a maximal projection, if it does not project any further.

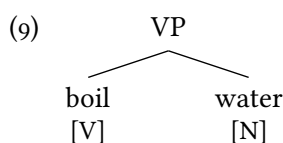
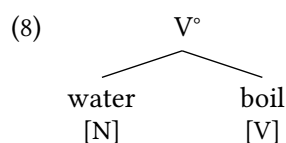
In other words, according to Embick & Noyer's definition, only the bottom A node is a morphological word, which is of course not what they want to say. Furthermore, the notion of "subword" becomes a contradiction, because every X° is a MWd.³

To make the problem a bit more explicit, consider the following two structures:



(6) is the base for the word form *water boiler*, while (7) is the start of a derivation that leads to a verb phrase (*to*) *boil water*. The only difference seems to be the order in which both words appear, but this is not a property we would like to rely on, obviously: it will hardly do to argue that morphology branches to the left while syntax branches to the right. Besides, it is by now a common assumption that syntactic structures do not define linear order.

The point here is that when two heads such as *boil* and *water* are merged, the structure is still indeterminate: it could be the start of a derivation yielding *water boiler*, but it could also yield *to boil water*. A possible response to this problem might be to argue that the trees should properly be represented as in (8) and (9), although it should by now be obvious that this does not bring us anything:



Such a representation simply begs the question. The zero-level projection marker and the "VP"-label are really just mnemonic devices reminding us of the kind of structure that we are

³Note that this technical argument applies only to systems that assume no separation between syntax and morphology, such as DM. However, the point that it is not possible to reliably distinguish between words and phrases is independent of the theoretical framework one chooses, as Haspelmath (2011) shows. That is, lexicalist theories and theories such as that of Ackema & Neeleman (2004) face the same problem, but it turns up as the problem of deciding which structures are built by which module.

dealing with: a “morphological” and a “syntactic” structure, respectively. One can of course raise such mnemonics to the status of theoretical devices, but that does not change the fact that they are there to make a distinction that does not follow directly from the properties of the elements involved: the fact that we combine an N and a V head does not tell us whether we are dealing with morphology or with syntax.

This is a point that is well worth dwelling on for a second: our model of grammar is based on the intuition that there is a distinction between the word-level and the phrasal level. This notion pervades our thinking about language, it guides our analyses every step of the way. It is reflected in our descriptive machinery, which we use without realising that something like “V” or “VP” is nothing more than a mere description of what we observe, it is not an explanation.

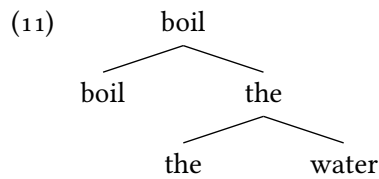
The existence of languages with elaborate and highly regular morphology emphasises this point, as Jackendoff (2002) also points out. Take the Classical Nahuatl word form *ahōniccuah*, which contains the following morphs:

- (10) *Nahuatl*
 ah- ō- ni- c- cua- h
 NOT ANT 1sg.S 3sg.O eat PERF
 ‘I have not eaten it.’

The single Nahuatl ‘word’ *ahōniccuah* corresponds to a five-‘word’ sentence in English. There is no sensible way for us to claim that the Nahuatl word is constructed through mechanisms fundamentally different from the English sentence. Semantically, the two utterances must express the same structure, and it would be unlikely if the language faculty were to contain two fundamentally different mechanisms to generate functionally similar structures. At the very least we should proceed from the hypothesis that it does not.

Ackema’s (1995) proposal and the others mentioned above are compatible with this point, in that they argue that there is no distinction between syntactic and morphological operations. The problem remains, however, that they cannot explain why the Nahuatl ‘word’, while built by the same types of operations, still looks different from the English sentence. Their explanation is that there are simply different kinds of elements to which the operations apply: $X^{<0}$ and $X^{\geq 0}$. But this is merely begging the question, a notational device introduced to describe the difference. If we drop the notational device, we have no way of deriving the empirical differences.

The only difference that seems empirically true is that the syntactic tree but not the morphological tree can be expanded with functional elements. A functional element such as *the* may not appear in a morphological tree. That is, in syntax, but not in morphology, we may have the following:



That is to say, *in English*. There are, however, many languages with affixal determiners. Similarly, can we really say that the Nahuatl example in (10) does *not* contain functional structure? But if it does, how are we to make sense of this fact? The usual assumption, that the affixes are either a morphological reflex of syntactic features on the lexical head, or that the lexical head moves to the functional heads to “pick up” the affixes, is inspired by our preconception that morphology and syntax are different. It follows from the assumption, it does not prove it.

Bare phrase structure also changes the notion of *head*. The usual notion of head states that a head is an indivisible unit in syntax, a terminal element in the syntactic tree. In bare phrase structure, the head is the element that projects. Note that once a specifier is added to a structure, the projecting element, the *head* in Chomsky’s terminology, is complex, as it consists of a traditional ‘head’ plus a complement.

We may or may not adopt Chomsky’s definition of the term *head*.⁴ The point is that what is traditionally called a head in syntax is not a primitive notion of the theory anymore, but a *derived* one. A head (in its traditional sense, not in Chomsky’s revised definition) is a syntactic structure that is simplex, i.e., not created by the operation Merge. One (far-reaching) consequence of this is that we can no longer rely on the notion of *head* in our syntactic analyses: we cannot exclude a certain syntactic operation from applying to a phrase merely by stating that said operation can apply to only heads or, vice versa, we cannot exclude a syntactic operation from applying to heads by stating that it can only apply to phrases. Syntactic operations are only sensitive to the feature makeup of the elements involved. Without performing an *additional* check, the syntactic component does not know if a certain structural object is a head or not.

What this means is that heads may be specifiers or complements. In a bare phrase structure approach, this is essential, otherwise pronouns could never be subjects or objects. (Nor could a determiner merge with a noun!) But it has a further consequence: we can no longer rule out a phrase moving into or adjoining to a head position. This consequence is rarely (if ever) acknowledged in generative syntax, but it *is* a consequence. We will therefore need another way of ruling out unobserved operations such as whole DPs moving into V° positions.

Note that this is not just a problem of some far-out theory of syntax. It is a real problem that is simply obscured by our preconceptions. We intuitively feel that there should be a difference between syntax and morphology, that is, between operations applying to phrases and operations applying to words. Because of this intuition, we have constructed our models in such a way that they reflect this distinction. But that does not mean that the distinction is there, at least not in the way that our models suggest.

⁴In fact, I shall not do so. When I use the term *head*, it refers to a terminal, simplex element.

2.3 Making sense of the intuition

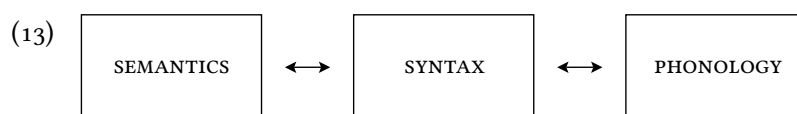
I do not wish to claim that the entire distinction between syntax and morphology is an illusion. There *is* a distinction, it is just not there where we suspect it. Our intuition that there is a difference between the level of the “word” (however vague that notion is) and the level of the clause is in some way correct, and our model of grammar should reflect it. It should just reflect it in a different manner than we are used to.

As mentioned above, a linguistic sign is a pairing of form and meaning. In modern linguistic thinking, this means that a linguistic sign consists of three sets of features: semantic, syntactic and phonological.⁵ As I discuss below in section 3.1, I assume that the semantic, syntactic and phonological structures are built up in parallel, each in its own module, with each module dealing only with the features relevant to it.⁶

In line with this view of the grammar, a lexical item can be represented as a three-way association of features:

$$(12) \quad \lambda x(\mathbf{car}(x)) \leftrightarrow \left[\begin{array}{l} \mathbf{N, sg} \\ \mathbf{count} \end{array} \right] \leftrightarrow /kaɪ/$$

Important in this representation is that the three groups of features are separate, which is why they are visually separated here. Analogously, we may represent the grammar model as in (13):

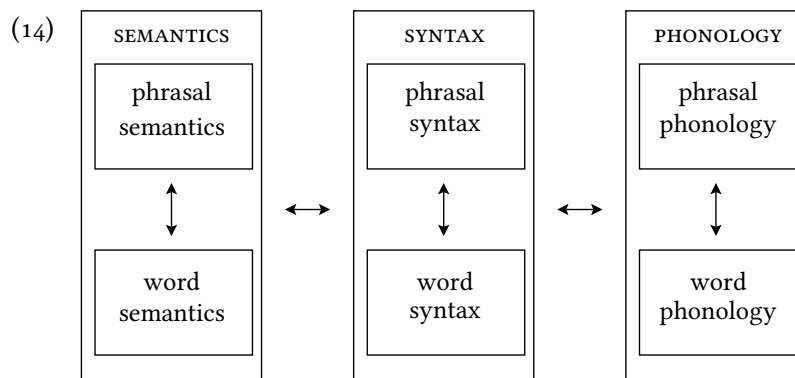


The representation of the grammar and of lexical items employed here is inspired by the grammar model developed by Jackendoff (1997, 2002).⁷ What is relevant at this point is that the distinction between morphology and syntax is usually placed in the second box, the one that builds structures. Ackema & Neeleman (2004) generalise this and assume that each module has two submodules, one for phrasal structures and one for word structures:

⁵Cf. Chomsky (1965: 214, fn. 15, cited in Freidin 2003): “We might, then, take a lexical entry to be simply a set of features, some syntactic, some phonological, some semantic.”

⁶This seems in contradiction with common assumptions in minimalist syntax, which hold that syntactic structure is built up in phases, with each phase ending in the transfer of the phase complement to the interfaces. I do not believe there is a real contradiction, however. See section 4.1 below for discussion.

⁷Though I do not subscribe to all the details of his model. See section 4 for discussion.



But why? Why do we need to distinguish a word level box and a phrasal level box in each of the macromodules? Certainly the semantics box does not seem to need it. Whether we use a word such as *ahōniccuah* or a phrase such as *I have not eaten it*, or whether we say in English *unbearable* or in Arabic *lā yuḥmal* (lit. ‘it is not borne’), the semantics is the same. In other words, the semantics box can do without the two submodules.

However, given that we do not want to assume that the structure-building operations behind *I have not eaten it* are fundamentally different from the structure-building operations behind *ahōniccuah*, we should ask ourselves why we would want to assume two submodules in the SYNTAX box. Or, to phrase that question a bit more generally: what is the *actual* basis for making such a distinction? Why do we say that *boil water* is fundamentally different from *water boiler*?

The directly observable differences between syntactic and morphological structures are phonological in nature. That a *hót-dōg* is different from a *hót dōg* is reflected in the stress pattern. That *boil water* differs from *water boiler* is obvious from the word order,⁸ the phonological element /əɪ/ and perhaps also the stress pattern. We say that *-er* is a suffix and thus belongs to morphology because of its requirement to attach to a stem. But this requirement is really a *phonological* requirement: it is the syllable /əɪ/ that must attach to a prosodic word in order to be phonologically licit.

We have no direct access to the SYNTAX box in (14). Our assumption that it is divided into a word level and a phrase level box is based solely on observations made through the phonological system of language, i.e. on our observations of the phonology box. What is more, the distinction is very old and dates from a time when the structure of the phonology box was not very well understood.

Nowadays, however, we know that the prosodic structure of an utterance is essential for shaping its phonology. It is generally recognised that there is a *prosodic hierarchy* in phonology (cf. Selkirk 1981, 1984, 1995, Nespor & Vogel 1986, Truckenbrodt 1995). This hierarchy has the Utterance at its top, and the syllable at its bottom:⁹

⁸Which, in current minimalist thinking, is a PF phenomenon, cf. Chomsky (1995), Nunes (2004), Richards (2004) Fox & Pesetsky (2005), Kremers (2009), etc.

⁹The symbols referring to the various categories are essentially the ones Nespor & Vogel (1986) introduced. Although other abbreviations exist in the literature, I will continue to use the ones presented here. Note also that there is much discussion in the literature about additional levels, such as a major and minor phrase, replacing the phonological phrase, a phonological word above the prosodic word, a clitic group between prosodic word

- (15) Utterance (U)
 Intonational phrase (IntP)
 Phonological phrase (φ)
 Prosodic word (ω)
 Foot (Ft)
 Syllable (σ)

The prosodic hierarchy is subject to the *Strict Layer Hypothesis* (SLH), which essentially state that the hierarchy is exhaustive and non-recursive. Each element at level n is completely contained in an element at level $n + 1$, while containing one or more elements of level $n - 1$. That is, an utterance contains one or more intonational phrases, and each IntP is contained in exactly one U (which it may share with other IntPs). In turn, each IntP contains one or more phonological phrases, etc. Furthermore, an element at level n cannot contain another element of level n . A prosodic word may not contain another prosodic word, a φ cannot contain another φ , etc.¹⁰

In the phonological literature, it is assumed that there are rules governing the mapping of syntactic structure onto prosodic structure. One of the most fundamental rules is that a (lexical) XP in syntax corresponds to a φ . These correspondence rules are not absolute, that is, there are cases where the syntactic structure and the phonological structure do not line up. This is in part due to conflicting correspondence rules, in part to the fact that syntactic structure is recursive, while prosodic structure is not, and in part to the fact that after the correspondence rules establish an initial prosodic structure, readjustment rules can rearrange the boundaries of prosodic constituents.

Phrase-level syntax maps primarily onto the φ -level in prosodic structure, to a lesser extent also onto the level of IntP. Morphology maps onto the levels of the prosodic word, the foot and the syllable. *Well, obviously*, one is tempted to say, because morphology operates below the word level. But is this so obvious? I believe not. We should really be looking at it the other way around: it is not the structure-building component (either syntax or morphology) that determines which prosodic levels its output is mapped onto. Rather, it is the prosodic level on which the effects of a certain operation are visible that directs—or rather *squints*—our view of this operation as syntactic or morphological.

Consider this for a moment. *Ahōniccuah* is a single prosodic word and is therefore considered a morphological structure. *I have not eaten it* contains (at least) two prosodic words and is therefore considered syntactic. That is, there is nothing inherent to the structure-building operations behind *ahōniccuah* that force it to come out as a “morphological” structure. It is the phonological form that the structure-building operations map onto that prompts us to view it as a “morphological” structure.

Adopting this view leads us to an interesting conclusion. One crucial property of the prosodic hierarchy in (15) is that it is continuous: there is no break between any two levels. That is, if

and foot, and a mora below the syllable. Such discussions, however relevant to our understanding of prosodic structure, do not change the current argument and therefore do not need to concern us here.

¹⁰Here, I have factored out the SLH into two constraints. Sometimes it is argued that the SLH actually comprises more than two constraints. For example, Selkirk (1995) assumes four. Note that in OT approaches, the principles are assumed to be violable. These issues are not relevant to the point at hand, so I ignore them here.

it is indeed the phonology that determines our view of the structure building component, i.e., of the SYNTAX box in (14), then we have no basis for distinguishing between word-level syntax and phrasal syntax (“morphology” and “syntax” in traditional terminology, respectively). There should be only *one* structure building component, and its operations should be oblivious of the kinds of phonological structures associated with the symbols to which they apply.

3 Data

Let us turn to some data and see how the model sketched in the previous section works in practice. I discuss four cases in this section: deverbal nouns, specifically in Arabic, negation in German Sign Language (DGS), the Latin second-place affix *-que* ‘and’, and the Tagalog affix *-um-*, which behaves as an infix in certain circumstances. The data presented here is intended to show how morphological facts can be analysed without resorting to a separate morphology module or specific word-building rules in the syntax. Furthermore, the first two cases are facts that would be difficult to handle in a morphology module in any case, because they show interaction between syntax and morphology.

3.1 Arabic deverbal nouns

Arabic deverbal nouns, or *masdars*, are in many ways your typical garden variety deverbal noun. They allow two types of constructions, equivalent to Abney’s (1987) *Poss-ing* and *Ing-of* constructions:

(16) *Standard Arabic*

- a. ʔaqlaqa-nī -ntiqād-u -l-rajul-i -l-mašrūf-a
 annoy-1sg.Obj criticising-NOM DEF-man-GEN DEF-project-AKK
 ‘The man’s criticising the project annoyed me.’
- b. ʔaqlaqa-nī -ntiqād-u -l-rajul-i li -l-mašrūf-i
 annoy-1sg.Obj criticising-NOM DEF-man-GEN to DEF-project-GEN
 ‘The man’s criticising the project annoyed me.’

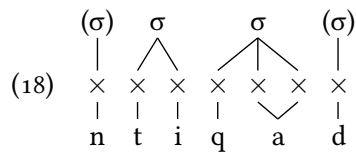
In these examples, the deverbal noun is (*i*)*ntiqād* ‘criticising’, from the verb *intaqada*. In (16a), it assigns accusative to its direct object *al-mašrūf* ‘the project’, making the construction the equivalent of the *Poss-ing* construction. In (16b), the object is realised as a PP with the preposition *li-* ‘to, for’, similar to the *Ing-of* construction.

Morphologically, *masdars* are quite complex. As McCarthy & Prince (1990) argue, they contain four morphemes, which are partially prosodic:

- (17) Root: «nqd» Nominaliser: «i.a»
 Stem VIII: (σ)σ_μ Non-finite: -σ_{μμ}
 |
 t

The root of the lexical item is the triconsonantal sequence «nqd». Since this root derives both verbs and nouns (and also adjectives, but those are morphologically indistinguishable from nouns), it must be considered non-categorical. Each root in Arabic can in theory derive up to fifteen different verb stems, which are numbered I–IV in the Western philological tradition of Arabic.¹¹ The stem VIII marker is partially prosodic, consisting of an extrametrical syllable and a short (full) syllable, which is linked to a segment «t». The masdar also contains a non-finiteness marker, which is also prosodic, consisting of a long syllable. Finally, the masdar contains a nominaliser, consisting of the vowels «i.a».

These four morphemes are combined into a pronounceable form by the phonological component of the grammar. Specifically, the form can be described as in (18):



Arabic has a rule that every stem must end in an extrametrical syllable (which is syllabified with the following word, if possible), which holds the final root consonant, here «d». Apart from this language-specific rule, the form (*i*)ntiqād is composed through general phonological principles, the most important one being Left-to-Right Association: the root consonants are associated left to right with the positions in the grid that are compatible with consonants (essentially the onset and coda positions). The same is true for the vowels: they are associated from left to right with the nucleus positions. The second vowel spreads to the adjoining grid position, which would otherwise remain empty.¹²

It is clear how the phonology puts the morphemes together in order to create a word form. What is not clear, however, is how the four morphemes actually come together. Assuming that the word form is built up in the morphology, i.e., in a grammar module that is separate from syntax, after which it is inserted into the syntactic structure as a single head does not explain why the masdar can assign accusative case. One might argue that morphology has the option to add an accusative feature to the word form it produces, so that it is able to assign accusative in syntax, but this would be a mere stipulation.

The syntactic account of deverbal nouns, proposed by Abney (1987), is able to account for this fact and for the fact that deverbal nouns can appear not only in the Poss-ing construction, but also in the Ing-of construction. Abney's account is rather straightforward: the attachment site determines the type of construction that is built. If the *-ing* suffix is attached to V°, it creates a head N°, so that the object must be licensed with a preposition. If *-ing* attaches to the VP, the verb can license its object inside the VP through accusative case, but the subject must be realised as a possessor, because *-ing* turns the VP into an NP. The functional projection embedding the NP is obviously a D projection, not an Infl projection, so that nominative case is not available.

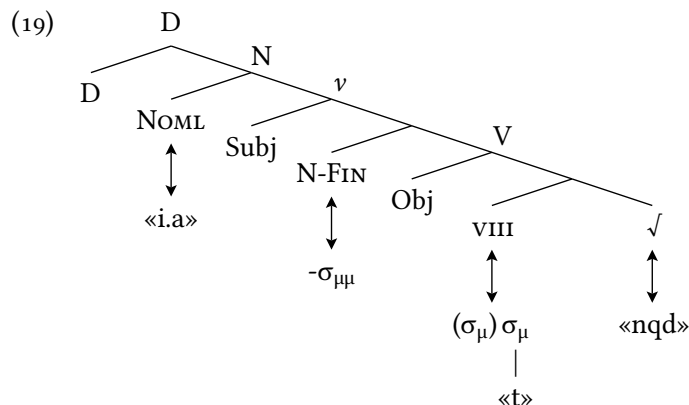
Fassi Fehri (1993) provides an account of Arabic masdars along these lines. The problem with this analysis is that it does not account for the word form. It is not clear in Fassi Fehri's account

¹¹Though no root exists for which all fifteen are instantiated.

¹²In principle, this position can also be filled with a consonant, but since the «d» is associated with the final syllable, no consonant is available.

how the actual word form is created. Abney’s analysis includes a proposal that accounts for the creation of the gerund form, but even though this is a much simpler form, the account is not entirely convincing. Abney extends the X-bar schema below the word level, which, as discussed above, means that he complicates the syntax in order to accommodate the special properties that morphological structures have.

In Kremers (2007), I develop an analysis of masdar structures in which the four morphemes posited by McCarthy & Prince are distributed over the syntactic tree and word formation takes place through head movement. The tree that I propose is the one in (19):¹³



It should be kept in mind that although the phonological forms are represented in the tree here, they are not involved in the syntactic computation. They only play a role in the phonological computation. For this reason, the associations to phonological structure are indicated with double arrows. This is to emphasise the fact that we need to think of the syntax as a computation with abstract morphosyntactic features, not as a computation involving “words”.

In (19), I have labelled the combination of the stem marker VIII and the root V, because the combination of the two morphemes establishes the verbal meaning *to criticise*. I take the non-finiteness marker to be the little *v* head, although nothing in the current analysis hinges on this. The nominaliser is added high in the structure here, which means that the resulting structure is a Poss-ing structure. For an Ing-of construction, the nominaliser would attach lower in the structure.¹⁴

A syntactic theory of word formation now needs to explain how the four morphemes end up together so that the phonology “knows” they must be realised as a single word form. The standard mechanism for this is head movement: the root moves to VIII, which then moves to N-FIN and further to NOML. Apart from the fact that these movements are not syntactically motivated (they are merely assumed to take place in order to get the phonological form to come out right), they complicate the syntax. If a head X moves, why would it be that it moves to the next higher head Y, and why would it not be possible for X to move further, stranding Y again?

¹³In fact, in Kremers (2007) I labelled the root «nqd» as V, which is not correct, as the root is non-categorial: it can also derive nouns.

¹⁴Note that in that case, we would also expect the non-finiteness marker to be attached lower, which seems incompatible with the assumption that N-FIN corresponds to *v*. Since this issue is not relevant to the present discussion, I will leave it aside here.

In fact, as Ackema & Neeleman (2004, 2007) point out, excorporation of a head is possible in what they call syntactic X° complexes. If all complex heads are formed in syntax, why would excorporation be possible in some, but not in others?

In other words, a syntactic theory of word formation complicates the syntax to the point that we need to assume the existence of different kinds of complex heads, to which different constraints apply. This of course essentially amounts to sneaking the syntax/morphology distinction into the syntax. On the other hand, assuming morphological word formation in this case raises the question why the masdar can assign accusative case at all.

The solution to this problem is that word formation here is in fact neither morphological nor syntactic. Rather, it is phonological. We have already seen how the phonology constructs the word form, all we need to do is specify how the phonology “knows” that it needs to combine exactly these four morphemes into a single word form. The mechanism that is needed here is actually rather straightforward and has already been proposed by Ackema & Neeleman (2004). What we need is a principle governing the mapping from syntax to phonology that ensures that if a head X is combined with a structure Y , X and Y are phonologically realised together. This is what Ackema & Neeleman’s principle of *Input Correspondence* does:¹⁵

(20) *Input Correspondence*:

If X selects (a projection of) Y , $\Phi(X)$ selects $\Phi(Y)$.

The notation $\Phi(X)$ here and below in this paper is to be read as “the phonological material associated with the syntactic structure X ”. *Input Correspondence* ensures that when the tree in (19) is mapped onto phonology, the four morphemes are realised together: the stem marker VIII selects the root, so that $\Phi(\text{VIII})$ must combine with $\Phi(\sqrt{\text{V}})$. N-FIN selects the category V , NOML in turn selects little ν (i.e., N-FIN). The result is that all four morphemes must be combined together, without syntactic movement having to take place.¹⁶

The crucial point here is that the word form that results from the structure is not just a function of the syntax or the morphology. It very much depends on the phonological form of the relevant morphemes. That seems like a platitude: if we combine a verb in English with a gerund affix, then obviously the phonological form /ɪŋ/ of the gerund marker determines that the word form comes out as /drɑ:vɪŋ/ or /swɪmɪŋ/, and not /drɑ:vɹɪŋ/ or /swɪmɹɪŋ/, or something.

Yet, on the other hand, it is not a platitude: what I am proposing is that the phonological form onto which an element is mapped has a larger influence on the final outcome of the derivational process than is usually assumed. For example, I assume that the fact that /ɪŋ/ is a suffix is simply part of the phonological matrix of the lexical entry *-ing*. That is, the fact that *drive*_V+*-ing* comes out phonologically as e.g., /drɑ:vɪŋ/ and not as /ɪŋdrɑ:v/ or /drɪŋɑ:v/ is a phonological fact. It is not something that needs to be derived in morphology or syntax, it follows from the lexical specification of *-ing* as a suffix.

One could argue that this leaves unexplained the fact that many languages have a preference for suffixes over prefixes. However, this fact is most likely not something that should be expressed as a rule of grammar. Hawkins & Gilligan (1988) argue that the reason for this and

¹⁵But see also Sadock (1992) for a very similar principle, holding between syntax and morphology.

¹⁶Note that this does not account for the word order in (16) yet. See section 4.2 for further discussion.

related preferences should be sought in performance properties, both in production and in parsing. If they are right, we would not want to encode a preference for suffixes in the grammar, because this preference follows from third-factor effects.

If we adopt the stance that the fact that *-ing* is a suffix is a phonological matter, we actually bring *-ing* in line with the prosodic morphemes that make up the Arabic masdar (and in fact much of Arabic morphology). With the masdar, it is quite clear that we do not wish to incorporate the exact placement of each morpheme in the word into our (morpho)syntax. It is much easier to let the phonology do this job, that is where all the relevant information is available anyway. The status of *-ing* as a suffix is essentially the same thing, just less extreme.

3.2 Negation in DGS

Another domain in which a synthesis of syntax and morphology is helpful in adequately accounting for the data is negation in sign language.¹⁷ The problem we face here is best illustrated with two basic negation facts from German sign language (*Deutsche Gebärdensprache*, DGS):

(21) DGS

- a. **head:** neg
hands: MOTHER FLOWER BUY
 ‘Mother does not buy a flower’
 (Pfau & Quer 2002)
- b. **head:** neg
hands: MOTHER FLOWER BUY
 ‘Mother does not buy a flower’
 (Pfau & Quer 2002)

The most common way to realise negation in DGS is (21a): a headshake accompanies the manual verb. No other negation is necessary.¹⁸ At first sight, the most straightforward analysis of negation would appear to be that it is a morphological negation marker, which is exactly what Pfau & Quer (2002) do.¹⁹ But this analysis is called into question by the fact that the non-manual negation can in fact spread over the entire VP, as seen in (21b): the headshake not only accompanies the manual verb, it also accompanies the object FLOWER.

If the non-manual negation were a morphological marker, this should be quite impossible. The answer, again, is to assume that the negation is simply a head in the syntactic structure, and that the phonology takes care of its realisation. The syntactic structure does not need to instruct the phonology where or how to realise it, it follows automatically from $\Phi(\text{Neg})$ and from general phonological principles.

¹⁷In fact, the problem is not limited to negation in sign language, it is much more pervasive. See Kremers (submitted) for details.

¹⁸As Pfau (2008) notes, it is in principle possible to add a manual NOT to the sentence, but this is hardly ever done.

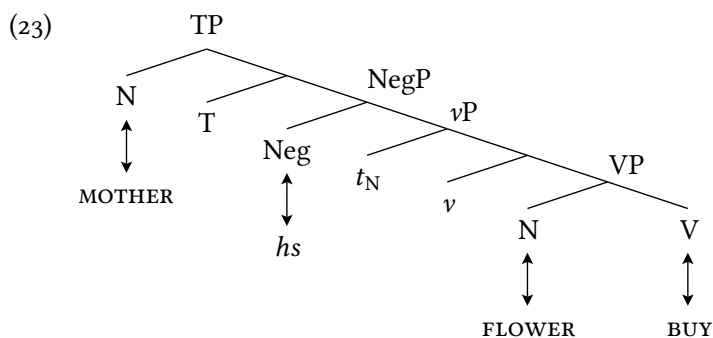
¹⁹See also Pfau (2002, 2008) for this view. Note, however, that such an analysis still faces the same questions that were raised in relation to Arabic deverbal nouns: if word formation is syntactic, we must assume head movement without syntactic motivation, and if we assume word formation is morphological, we have to explain why negation is sentential.

Let us see, then, how this works. I assume that the lexical entry for the negation is something along the lines of (22):

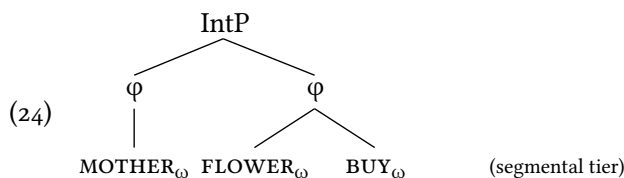
$$(22) \quad \neg \leftrightarrow [\text{Neg}, uV] \leftrightarrow \begin{array}{c} hs \\ | \\ \omega \end{array}$$

Since semantics is not relevant to the issue at hand, I have simplified the semantic representation here. Syntactically, negation consists of a Neg head that selects a verb. Phonologically, the negation consists of a headshake,²⁰ which I have represented as *hs*, for lack of a true phonetic transcription system for sign languages. More importantly, I have added an additional specification to the phonological form: (22) states that the headshake is associated with a prosodic word.

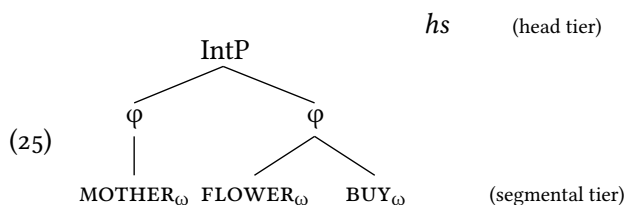
The syntactic structure of the clause in (21a) is roughly (23):



When this structure is mapped onto phonology, the phonological system is forced to linearise MOTHER, FLOWER and BUY. Because the object FLOWER and the verb comprise the VP, the two signs are joined in a phonological phrase. The resulting structure is (24):

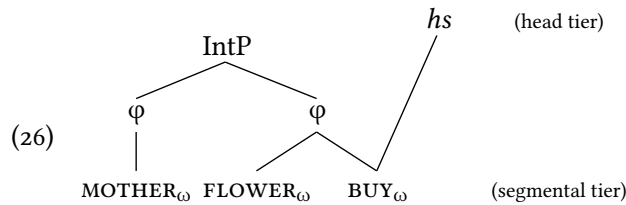


The negation is a prosodic morpheme, realised on an autosegmental tier:

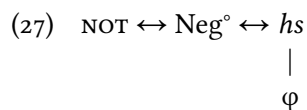


²⁰Note that Pfau (2001) assumes that the manual NEG sign that is optional in DGS (and in fact seldomly used) is in Spec,NegP. Neg° corresponds to the headshake.

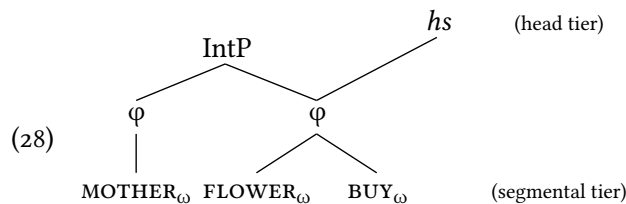
The phonological form of the negation specifies that it must be associated with a prosodic word. The segmental tier, however, contains three prosodic words. At this point, Input Correspondence becomes relevant: Neg° selects a verbal projection, which means that $\Phi(\text{Neg})$ must be associated with $\Phi(V)$. That is, Input Correspondence dictates that the headshake must be associated with the verb *BUY*:



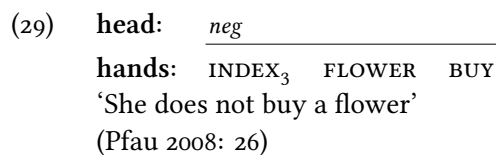
The possibility of spreading exemplified in (21b) can be accounted for by assuming that an alternative phonological form exists for the negation:



When this phonological form is selected, the headshake does not associate with just the verb. Crucially, however, it still obeys Input Correspondence, meaning that it associates with $\Phi(V)$, but now not with the prosodic word containing $\Phi(V)$, but with the phonological phrase containing $\Phi(V)$:



The assumption that the association between the headshake and the segmental tier is phonological is supported by the fact that when the subject does not constitute a phonological phrase on its own, negation can spread over it as well:



In (29), the subject of the clause is a third person index, i.e., a pronoun, which does not constitute a separate phonological phrase. Instead, it is incorporated into the prosodic word that corresponds to the object, and hence into the phonological phrase that corresponds to the VP. In this case, if negation spreads over the phonological phrase, it spreads over the subject as well.

The analysis of DGS negation presented here has several advantages over a syntactic or morphosyntactic analysis. Most importantly for the present issue, it is not necessary to distinguish between a syntactic and a morphological structure. We do not need to answer the question whether the non-spreading negation is morphological or syntactic, we just need to assume the tree in (23). Furthermore, we also do not need to assume that the verb moves to Neg° in order to account for the association of the negation with the verb. As such, the current analysis presents the simplest analysis possible.

3.3 Latin *-que*

Another area where giving up the distinction between syntax and morphology allows for simpler analyses is in second place clitics. I will illustrate this point with only one clitic, Latin *-que* ‘and’, which Embick & Noyer (2001) have analysed within the framework of Distributed Morphology. In Embick & Noyer’s analysis, Latin *-que* attaches to the first MWd of the second conjunct.

- (30) *Latin*
 bon+ī puer+ī bon+ae-que puell+ae
 good+NOM.PL.M boy+NOM.PL.M good+NOM.PL.F-and girl+NOM.PL.F
 ‘good boys and good girls’

The analysis that Embick & Noyer propose is in essence rather simple: a morphological operation places *-que* after the first MWd of its second conjunct. However, as Embick & Noyer note, when a preposition is involved, the picture becomes more complicated:

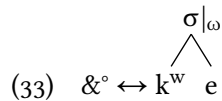
- | | |
|--|--|
| <p>(31) a. circum-que ea loca
 around-and those places
 ‘and around those places’</p> <p>b. contrā-que lēgem
 against-and law
 ‘and against the law’</p> | <p>(32) a. in rēbus-que
 in things-and
 ‘and in things’</p> <p>b. dē prōvinciā-que
 from province-and
 ‘and from the province’</p> |
|--|--|

If *-que* conjoins two prepositional phrases, the position of *-que* depends on the preposition of the second conjunct: if the preposition has only one syllable, *-que* attaches to the (first) word of the complement of the preposition. If the preposition is longer, however, *-que* attaches to it instead of the complement. For Embick & Noyer, these facts are difficult to explain: from a morphological point of view, it should not matter whether a preposition has one or more syllables. This is especially true in a DM approach, where it is assumed that the phonological form of heads does not enter into the syntactic computation at all.

The solution to the problem is of course rather straightforward: *-que* attaches to the first prosodic word of the second conjunct, as argued for by Agbayani & Golston (2010). Although we can only guess as to what the phonological structure of Latin was, it is a safe bet that a monosyllabic preposition did not form its own prosodic word, but was rather incorporated

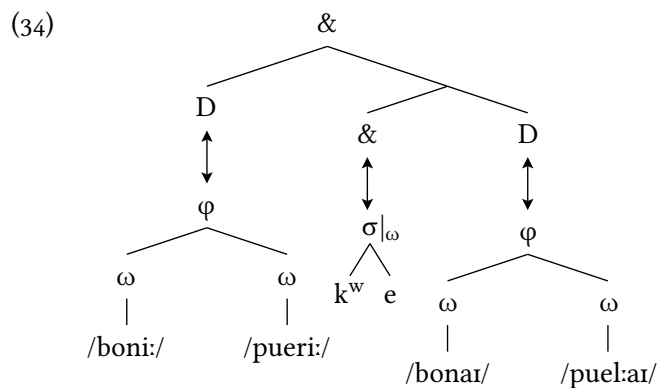
into the prosodic word of its complement, while bisyllabic prepositions behaved differently. They are phonologically heavier and presumably did form a separate prosodic word.

Embick & Noyer’s approach, which tries to account for the placement of *-que* in morphosyntactic terms, is fundamentally flawed: the positioning of the clitic is a phonological matter. We need to analyze *-que* as a prosodic morpheme:



I am assuming here that the syntactic head representing the conjunction is $\&^\circ$, even though the proper syntactic representation of conjunction is a complex matter that has not yet been resolved satisfactorily. For the present discussion, we can ignore these questions, focussing instead on the phonological structure of *-que*. The phonological specification in (33) says that *-que* is a syllable (σ), which is at the right edge of a prosodic word, indicated as $|_\omega$.²¹

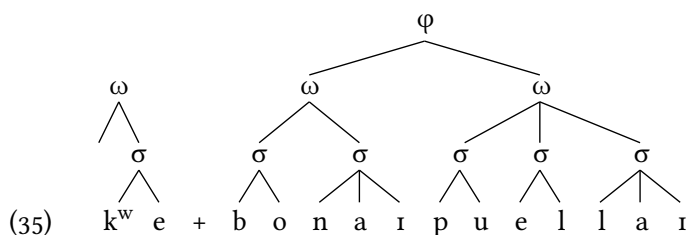
Assuming an $\&^\circ$ head, the syntactic structure of the conjunction is (34):



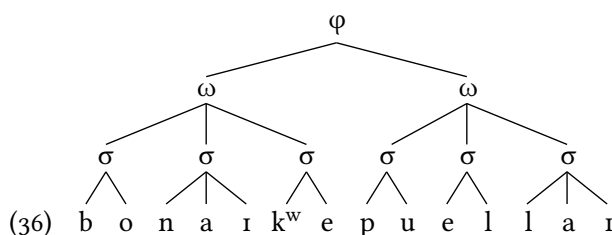
One assumption regarding the mapping of such structures onto phonology needs to be made at this point: $\Phi(\&)$, which does not constitute a separate prosodic word, is incorporated in the prosodic structure of its second conjunct. If this was indeed true for Latin,²² the phonological form of *-que* given in (33) suffices to explain the placement facts of *-que*. The phonological system needs to combine the following two elements:

²¹Note that I will use this notation with a vertical bar throughout to indicate prosodic domain boundaries. A subscript indicates the type of boundary (here a prosodic word boundary) and the position of the subscript indicates whether it is a left or right boundary (here a right boundary).

²²There are some indications that this is quite generally true: for example, it is usually easier to insert a pause between the first conjunct and the conjunction than between and the second conjunct, cf. *a man – and a woman* with *a man and – a woman*: the latter seems more marked. In some languages the conjunction actually cliticises onto the second conjunct, making separation almost impossible, cf. Arabic *al-nahār wa-l-layl* ‘day and night’.



Since /k^we/ needs to align with the right edge of a prosodic word, the only way to incorporate it into the larger structure is to attach it after /bonai/:



As with the previous examples, we see that by placing the process that builds the word form in the phonology, we are able to describe the structure and formation of conjunctions with *-que* without having to refer to a morphology module. We only need to assume a syntactic tree along the lines of (34) and a lexical entry for the conjunction along the lines of (33), and then the phonology does the rest.

My claim is in fact stronger than this: not only is it not necessary to refer to a morphology module, it is in fact a mistake to do so. One should not try to account for the form *bonaeque* in (30) by bringing the N° and the &° heads together in the hierarchical structure, after which the phonology is a relatively simple and “dumb” process that takes the tree and just plugs in the segments. After the hierarchical structure is built, but before phonology processes the structure, it is not clear at all in what order the elements in the tree are going to end up. The phonology takes an active part in determining the final linear order.

This is not to say that the process of phonological composition is non-deterministic. Given the same input structure, we expect the same output. It is just that the syntactic tree does not contain enough information to determine the output of phonology. The phonological forms of the elements in the syntactic tree influence the output of phonology as well and this information is (by definition) not part of syntax.

The area of grammar where this effect is felt most is no doubt word structure (i.e., *morphology* in its pretheoretic, descriptive sense), because constituent parts of words, i.e., affixes, are much more likely to determine their own alignment properties than constituent parts of phrases, i.e., words (although such cases do exist, cf. *warm enough* vs. *how/too/so warm*, cf. Jackendoff 2002). This is one of the factors that creates the impression of a separate module for word structure, but the impression is an acoustic illusion, in essence an epiphenomenon created by the interaction of several factors.

3.4 Tagalog *-um-*

The final example to be discussed here is one of the classics of Optimality Theory: Tagalog *-um-* affixation (Prince & Smolensky 2004: 40–43). As is well-known, the Tagalog prefix *-um-* (often called the *agent trigger*, i.e., it signals that the noun marked with so-called “direct” case is the agent of the verb) is realised as a prefix on stems that begin with a vowel but as an infix on stems that begin with one or more consonants:

- (37) a. *aral* – *um·aral*
 b. *sulat* – *s·um·ulat*
 c. *gradwet* – *gr·um·adwet*

In OT theory, these data are explained by the interaction of two constraints: NoCODA, which states that syllables should not have codas, and ALIGNL, which aligns the affix with the left edge of the stem. The following tableau shows the derivation of *um·aral*:

(38)

	NoCODA	ALIGNL
☞ u.ma.ral	*	
a.um.ral	**!	a
a.ru.mal	*	a!r
a.ra.uml	*	a!ra
a.ra.lum	*	a!ral

The constraint NoCODA ensures that the affix precedes the stem. If the stem starts with a consonant, however, this same constraint has the effect of moving the affix into the stem:

(39)

	NoCODA	ALIGNL
um.su.lat	**!	
☞ su.mu.lat	*	s
su.um.lat	**!	su
su.lu.mat	*	su!l
su.la.umt	*	su!la
su.la.tum	*	su!lat

Since *-um-* changes the argument licensing properties of the verb, I assume it is the instantiation of the *v* head, even though nothing really hinges on this assumption. The model described by Prince & Smolensky uses two constraints. Of these, ALIGNL does not really say anything

more than that *-um-* is a prefix of sorts. The question we need to answer here is which is better: to formulate a general but violable principle that prefers left alignment, or to simply incorporate this information in the lexical entry of *-um-*. Since Tagalog also has suffixes, ALIGNL is at best a tendency, not a constraint that applies to all affixes. I therefore assume that it is better to incorporate the alignment property into the lexical entry (cf. the remarks above regarding the English gerund suffix *-ing*).

The NoCODA constraint expresses a more general property of language: there is a general tendency to avoid codas, which expresses itself in many ways, perhaps most prominently in the fact that CV is the most basic syllable structure of human language. What we should ask ourselves, however, is whether we should incorporate such a constraint into the grammar or whether we are dealing with a third-factor effect. For example, there are strong indications that this general preference for onsets vs. codas has to do with the way the brain times phonetic events (cf. Goldstein et al. 2006, Nam 2007).

I therefore assume that the coda dispreference is not a rule of grammar but the result of architectural constraints of the brain that are essentially independent of language. In other words, NoCODA is not part of UG, nor is it part of the I-language of a speaker. Rather, it is a factor that influences the development of an I-language in an individual. As a result, a language may incorporate rules into its grammar that in some form or other disprefer codas, such as phonotactic restrictions, lexical or postlexical phonological rules, etc. However, the extent to which a language incorporates such rules will differ from language to language, because there may be other factors in the development of I-languages or in the historic development of a particular language that push the language toward having codas. For example, if in a language that has CV syllables word-final vowels are reduced to shwa and then dropped, CVC syllables result.

In OT-style analysis, NoCODA is of course not just a third factor effect influencing the development of an I-language. Rather, it is a violable rule of grammar. This of course raises the question why a root such as *sulat* has a coda in its final syllable at all. Why does it not come out as *sula*? The standard OT answer is of course that there is a faithfulness constraint FAITH that requires that the output is as faithful as possible to the input. If this constraint is ranked higher than NoCODA, it explains why *sulat* can have a coda.

But then what exactly is *faithfulness*? After all, a form such as *sumulat* violates at least one imaginable form of FAITH: if FAITH is interpreted as “do not break up sequences of segments”, the form *sumulat* violates it. If FAITH is then ranked higher than NoCODA, which it needs to be in order to account for the ungrammaticality of the form **sula*, we would expect *sumulat* to be excluded in favour of *umsulat*, despite the (double) violation of NoCODA of the latter form. Obviously, another interpretation of FAITH avoids this problem: if we interpret FAITH as “represent each input segment in the output” (more closely to how FAITH is usually understood), *sumulat* does not violate FAITH. But neither would *sumutal*.

We are therefore faced with the problem of finding a formulation of FAITH that does justice to the kinds of faithfulness that language shows. Note that both interpretations of FAITH is reasonable and valid for human language. Language does indeed tend not to break up sequences of segments in morphological processes: infixes are comparatively rare compared to prefixes and suffixes (Greenberg 1966). Similarly, morphological processes usually leave the base intact

to a large extent. Few processes are known whereby something is removed from the base, usually something is added.

In other words, FAITH is not a straightforward constraint. Like NoCODA, it is undeniably true that some form of faithfulness must be operative in human language, since deviating too much from the root of a word would cause incomprehensibility. However, explicitly encoding it in the grammar is problematic. Faithfulness can mean different things in different contexts. This indicates that faithfulness is not a grammatical rule. Rather, we are dealing with a third-factor effect of sorts. It seems reasonable to assume that language underlies some recoverability requirement, in the sense that the form of an utterance must enable the parser to reconstruct the original hierarchical structure.

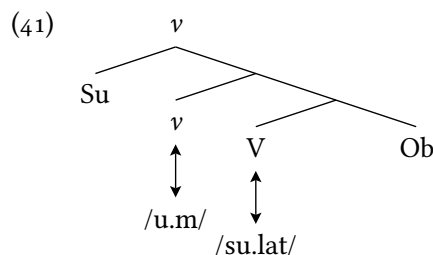
Like the preference for codaless syllables, I believe recoverability in this sense is also a principle that shapes language (and I-language) as it develops. It is not, however, a rule of the grammar and cannot be referred to in an account of specific derivations. The effect it has is that the grammar is a rule-based²³ system, that does not arbitrarily change or create forms.

If we interpret both FAITH and NoCODA as meta-principles rather than as grammatical principles, then we need a different way of explaining the placement behavior of *-um-*. The way to do this is rather straightforward and essentially amounts to encoding the coda-avoiding property of *-um-* directly into the phonological form: despite appearances, *-um-* is not a single syllable, it is bisyllabic. There is a syllable boundary between the two segments, that is, /m/ occupies an onset position.²⁴ We can express this by representing the morpheme as /u.m/, or more elaborately, as in (40):

$$(40) \quad [v, +ag] \leftrightarrow \begin{array}{c} \omega | \sigma \quad \sigma \\ \wedge \quad \wedge \\ u \quad m \end{array}$$

Here, the feature [+ag] is simply meant to represent the fact that *-um-* is an agent trigger. For convenience' sake, I have left out the semantic part of the lexical entry. The important part in (40) is the phonological part: a bisyllabic structure with two segments occupying slots in different syllables. In other words, *-um-* is a prosodic morpheme. Additionally, there is a prosodic word boundary at the left edge, meaning that /u.m/ is left-aligned (i.e., a prefix).

Syntactically, I assume that *-um-* is a *v*-head, as I mentioned above. This means that a clause containing *-um-* has a syntactic structure along the lines of (41):



²³Or constraint-based, or a combination of both. The considerations discussed here apply regardless of whether the grammar is rule-based or constraint-based, I believe.

²⁴Cf. McCarthy & Prince (1993: 79), who state that *-um-* “falls as near as possible to the left edge of the stem, so long as it obeys the phonological requirement that its final consonant *m* not be syllabified as a coda”.

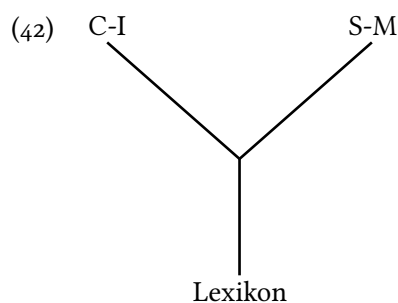
By now it should be obvious that we do not need to assume much more than this structure: Input Correspondence ensures that $\Phi(v)$ selects $\Phi(V)$ and the phonological requirement that /u.m/ is left-aligned and bisyllabic can only be accommodated by creating the form *sumulat*. We do not need a morphological structure, Input Correspondence and the phonological structure of the affix is all we need to account for the data.

4 The grammar model

The data discussed so far all involve morphological structures or structures that are at least partially morphological, with some interactions with syntax. But since the essential idea of the current proposal is that there is no distinction between syntax and morphology, the natural question to ask is how the proposal deals with syntactic structures and whether there are benefits in this area. In this section, I discuss several issues that may benefit from an analysis as outlined here. Before I go into that, however, I wish to discuss the grammar model behind the analysis in a bit more detail.

4.1 Parallel construction

The standard grammar model in minimalist theories is the so-called Y-model:



Derivation proceeds from the lexicon (or lexical array/numeration), merging elements until a phase is complete. The phase complement is then sent off (spelled out/transferred) to the interfaces, while the phase head and the edge can undergo further derivation, possibly accessing the lexicon or numeration again (cf. Chomsky 1995, 2001, 2008 and much related work). In this model, phonological and semantic structures are derivative of syntactic structure. As a result, an often-heard criticism of this model is that it cannot account for facts where phonological form appears to influence syntactic structure.

One such example is the familiar case of Heavy-NP Shift. Zec & Inkelas (1990) argue that in English, Heavy-NP shift is allowed when the shifted noun phrase consists of at least two phonological phrases. This accounts for the contrast in (43):

- (43) a. Mary gave to Susan (that report)_φ (on Dukakis)_φ (Inkelas 1989)
 b. *Mary gave to Susan (that report on him)_φ

In (43a), shifting the object *that report on Dukakis* is acceptable, because it consists of two phonological phrases. In (43b), on the other hand, the object *that report on him* consists of only one phonological phrase, so that shifting it is not allowed.

Another example of such phonology-syntax interaction is discussed by Richards (2010) (see also Richards 2006, Smith 2011). Richards shows that there appears to be a universal tendency that a *wh*-word needs to share a phonological phrase with a (possibly covert) interrogative complementiser.²⁵ He discusses several unrelated languages (Japanese, Basque, Tagalog, Chicheŵa) that all appear to have this requirement, although the way in which it is met differs: Japanese and Chicheŵa can create the relevant phonological phrase without moving the *wh*-word (i.e., they are *wh-in-situ* languages), Tagalog needs to front the *wh*-word (i.e., it has overt *wh*-movement), while Basque appears to move all overt material around the *wh*-word, so that the *wh*-word ends up sentence-finally.

The parameters that play a role here are the position of the complementiser (sentence-initially or sentence-finally) and the direction of phonological phrase creation. In Japanese, the complementiser is sentence-final and phonological phrase boundaries are left-aligned (i.e., placed at the left edges of syntactic phrases), while in Chicheŵa, the complementiser is sentence-initial and phonological phrase boundaries are right-aligned. In both cases, it is possible to encompass the *wh*-word and the complementiser in a single phonological phrase, so that *wh*-movement is not required.

In Tagalog, the complementiser is sentence-initial and phonological phrase boundaries are left-aligned. This means that there is inevitably a phonological-phrase boundary between the complementiser and the *wh*-word (namely the one that the *wh*-word introduces itself), unless the *wh*-word is fronted. As a result, Tagalog is a *wh*-fronting language. In Basque, the reverse situation obtains: the complementiser is sentence-final, while the phonological phrase is right-aligned. Here, too, a phonological phrase boundary intervenes between complementiser and *wh*-word, which is resolved by vacating the VP.

Other facts that appear to require more phonology-syntax interaction than the standard Y-model allows are discussed in e.g., Inkelas & Zec (1990) and Erteschik-Shir & Rochman (2010). Such facts warrant the conclusion that the syntactic and phonological structures are not built sequentially but in parallel. Note that this is in fact not a very big deviation from current minimalist thinking: phase theory already removes the strict sequentiality that existed in earlier minimalist approaches. Phase complements are transferred to the interfaces before the entire derivation is finished, so that at least parts of the syntactic and phonological computations take place in parallel. The proposal that I make is in essence equivalent to saying that each head is a phase head, so that every merge triggers transfer and subsequent phonological (and semantic) computations.²⁶

In fact, in a slightly different interpretation of phases and transfer, there should be no contradiction between standard minimalism and the current proposal at all. In standard minimalism, transfer means that the phase complement is sent to the interfaces with the conceptual-intentional and the sensorimotor systems. These systems *interpret* the semantic and phonological representation of the derivation in question, they do not *generate* it: they are not linguistic

²⁵Richards uses the term *minor phrase*, which is in essence equivalent to the phonological phrase.

²⁶References.

systems.

But if the interface systems interpret a non-syntactic, linguistic structure, this structure must be generated before it can be sent to the interfaces. The obvious way to do this is to have them be generated in parallel with the syntactic structure. This is actually completely in line with Chomsky's view on lexical entries (cf. footnote 5). If a lexical entry is composed of semantic, morphosyntactic and phonological features, then introducing it into the derivation introduces *all* features into the derivation. Combined with the assumption that semantic, morphosyntactic and phonological features are each combined through different, module-specific principles, the picture we arrive at is essentially the one sketched above: parallel construction of semantic, syntactic and phonological structures.

There may appear to be some contradiction in the statements that on the one hand all features are introduced together into the derivation, while on the other hand the three bundles of features are combined in different modules. In reality, though, the term "module" is nothing more than a different way of saying that semantic features are combined through semantic principles, syntactic features through syntactic principles and phonological features through phonological principles. In this sense, syntax is phonology-free, and phonology is syntax-free.²⁷ What I wish to emphasise here, though, is that although syntax is phonology-free and vice versa, syntactic and phonological structure are built in parallel and are *interconnected*. One could say that they activate each other. Because a syntactic head such as [N,sg,count] is associated with a semantic structure $\lambda x(\text{car}(x))$ and with a phonological structure /kaɪ/, inserting the syntactic head into a derivation immediately activates the associated phonological and semantic features as well.

This then opens up the possibility that the activation of some semantic or (in our case more importantly) phonological structure "feeds back" into the syntax and triggers a syntactic operation that would otherwise not have taken place because it has no trigger in syntax. Or similarly, a phonological structure may inhibit a syntactic operation that would normally take place.²⁸ For example, the heaviness of the object may inhibit a movement operation that would otherwise move the object to Spec,vP, or, depending on the best way to analyse the resulting structure, it may in fact trigger a rightward movement of the object.²⁹

The parallel model I am describing here has some similarities to the parallel architecture that Jackendoff (2002) and Culicover & Jackendoff (2005) develop. There are some differences as well, however. Firstly, Jackendoff uses indices to establish correspondences between semantic, syntactic and phonological structures. As pointed out by Freidin (2003), such indices should be rejected because they violate the principle of Full Interpretation. I believe there is in fact no need for indices, because as discussed before, a linguistic sign is composed of semantic, syntactic and phonological features. As argued in the previous section, introducing a lexical item in the derivation activates all its features, so we do not need to establish the associations

²⁷Similar comments apply to semantics, of course.

²⁸Terms such as *feed back*, *activation* and *inhibition* are used here on purpose, being associated as they are with neuroscience. Although we are obviously still a far way off from being able to understand how our knowledge about language maps onto our knowledge about the brain, thinking in terms of information being activated and feeding or inhibiting the activation of other information does seem to be a practical metaphor if we wish to keep our linguistic thinking compatible to some useful extent with some future unification of the two knowledge domains.

²⁹See Abels & Neeleman (2009) for an argument that rightward movement may not be generally prohibited.

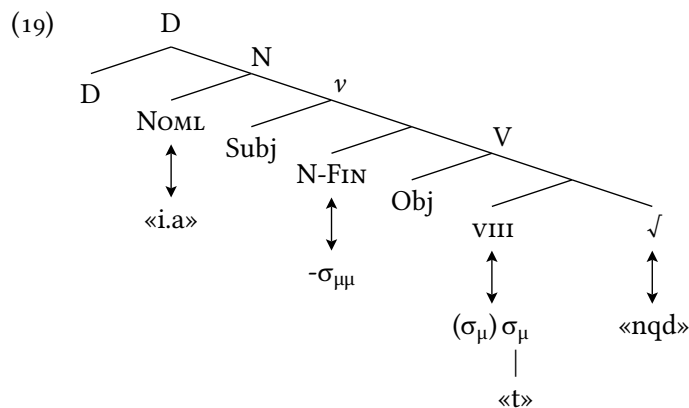
by means of some formal mechanism. The associations are given.³⁰

Secondly, Culicover & Jackendoff's model has a strong affinity to constructional theories of grammar: language competence is essentially accounted for as a set of constructions. While I do believe that constructions play a role in language performance, it does not seem likely that they can explain language competence. Constructions must be learnt, but before a child can even begin to entertain the notion that it might be helpful to do so, s/he needs to be able to recognise and analyse them.

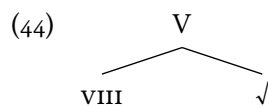
Therefore, even though I agree with Jackendoff (2002) that a lexical item is a three-way association of semantic, syntactic and phonological features (which, as we have seen, is Chomsky's point as well) and while I also agree with him that such three-way associations can be constructions, in the sense that they may contain more structure than just a syntactic head, there is a set of rules and constraints underlying the constructions of a particular language that describe the way in which syntactic heads may be combined into larger structures. After all, we make the same assumption about semantics and phonology: those are not systems that just randomly put elements together, their combinatorial properties follow certain rules as well.

4.2 Arabic masdars again

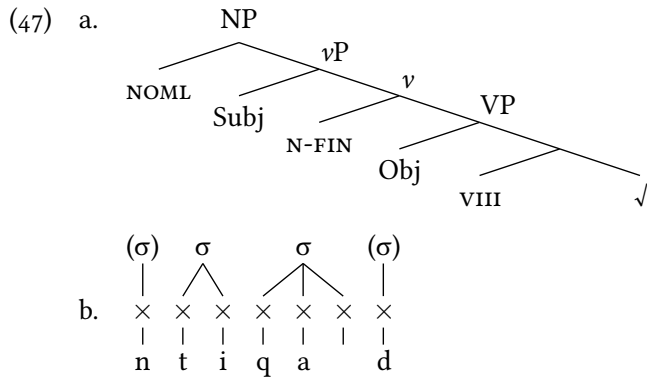
Let us consider the derivation of the Arabic masdar form from section 3.1 in some more detail to see how this parallel model outlined above, functions. The tree that we eventually want to arrive at is the one in (19), repeated here:



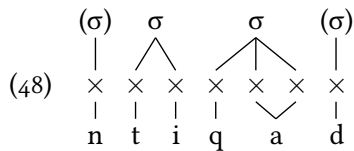
The first step here is the merger of the root and the stem marker, which yields the syntactic structure in (44):



³⁰It may at times be practical to use indices as a notational device, but they have no theoretic status.



The nominaliser introduces the vowel structure /i.a/ into the phonology. These segments are associated with the nucleus positions of the two syllables. At this point, the only issue left to consider is the remaining unassociated slot position. This, however, can easily be remedied by spreading, yielding the complete and licit form in (48):



At this point, the masdar form is phonologically complete and can be inserted into the linear string. Again, I will ignore the issue of linearisation and simply assume that the complete form is linearised in the position of the head that completes it, i.e., in the position of the nominaliser, and that this is linearised before the subject, so that the typical NSO order of Arabic masdars results.³¹

One important point to be made here is that the linear string that results from the process described here is not necessarily the final string: the phonological processes and structures that apply during this process are those that are traditionally associated with the lexicon. Postlexical processes do not take place here. They apply after the initial linear string is built, at a point where syntactic structure can no longer exert its influence, because the syntactic derivation has been completed. In this way, the distinction between lexical and postlexical phonology finds a natural place in the model.

5 Syntax above the word

Having discussed the grammar model to be assumed in somewhat more detail,³² we can now look at possible extensions of the model to syntactic issues. I discuss three topics here: linearisation of head and complement, focus and intonational contours. It should be noted that

³¹Note that the issue is in fact more complicated than I can discuss here. See Kremers (in preparation) for discussion.

³²Of course, various questions remain. Most pressingly, it is not clear how the parallel system can deal with displacement. This issue is not relevant for the issue at hand and will be discussed in Kremers (in preparation).

the discussions will be sketchy and tentative. The purpose here is mainly to indicate possible fruitful directions for further research, not to provide complete and detailed analyses of the relevant topics.

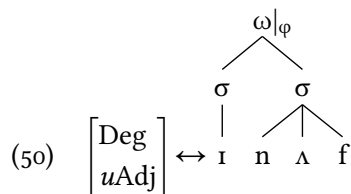
5.1 Linearisation: Head/comp

One area where an analysis in terms of phonological structure may be possible is linearisation. Even though this issue is often thought of in syntactic terms (inspired mostly by Kayne’s 1994 influential work), there are in fact good reasons to consider whether it may not be treated in phonological terms. First, linear order is primarily a modality requirement, i.e., an “external factor”, something that should not be part of the language faculty in the narrow sense (cf. Hauser et al. 2002). Furthermore, in the model proposed here, syntactic structure is actually underspecified for linear order. The order of the morphemes in the Arabic masdar, or the position of negation in German Sign Language cannot be determined on the basis of the syntactic tree alone. In order to establish the linear structure, it is necessary to consider the phonological forms of the elements to be ordered.

This point is emphasised by the fact that although linearisation is in many cases quite regular and predictable, there are cases of idiosyncratic linearisations. One such fact is pointed out by Jackendoff (p. 2002):

- (49) a. *so/how/very/too* good
 b. good *enough*

Adjectival degree heads in English such as *so/how/very/good* are normally linearised before the adjective, which is to be expected given that English is generally a head-complement language. However, in the case of *enough*, the only possible linearisation is Adj-Deg.³³ What is most likely happening here is that there is an idiosyncratic linearisation instruction that places *enough* after its complement. In the current proposal, we can simply incorporate this information in the lexical entry for the Deg head *enough*:



Here, the addition of a φ -boundary ensures that /I n Λ f/ is aligned with the left edge of a phonological phrase, resulting in the correct linearisation. Other Deg heads lack such a φ -boundary in their phonological representations, so that a default linearisation rule applies.

Within the VP domain, there are strong indications that (default) word order correlates with stress assignment. For example, Truckenbrodt (1995) notes that a head-initial VP corresponds to a φ -final stress, and vice versa:

³³Note that the point still holds if one were to assume that *enough* is not a Deg head but e.g., an adverb.

a requirement of the modality (i.e., of the sensorimotor system), then any method for deriving linear order from a tree structure will do and different methods may be used in different contexts.

In fact, this idea is not new, even though it is not always expressed as explicitly as I do here. For example, Abels & Neeleman (2009) argue that moved elements are typically linearised to the left. This is a linearisation principle that applies only to moved elements, which means that it has nothing to say about the linearisation of elements that remain in their base-generated positions. Therefore, if one accepts Abels & Neeleman's conclusions,³⁷ one must also accept the premise that not all linearisation statements are derived in the same way.

5.2 Focus

Another area where a phonological/prosodic approach may yield advantages is in the interaction of linear order and prosody. For example, Samek-Lodovici (2005) discusses the following pair of sentences:³⁸

(54) *Italian*

- a. [Gianni ha RISO]_f
Gianni has laughed
'Gianni laughed' (context: *What happened?*)
- b. Ha riso GIANNI_f
has laughed Gianni
'Gianni has laughed' (context: *Who laughed?*)

Samek-Lodovici notes that in Italian, the stressed p-word in the focussed constituent is right-aligned with an intonational phrase. In (54a), the clause is in focus, answering the question *What happened?*, causing the stressed verb *riso* 'laughed' to be placed at the right edge of the intonational phrase, yielding subject-verb order. In (54b), the order is verb-subject, with the focussed constituent *Gianni* right-aligned with the intonational phrase.

An admittedly simplistic approach, as the data are obviously more complex than this example shows, would be to say that there is an alignment requirement on focus, something along the lines of (55):

(55) *focus* ↔ X ↔ *|_I

This rule simply says that the semantic feature of *focus* is associated (through a syntactic indiscriminate head X) with an instance of stress that must be right-aligned in an intonational phrase (I). When the derivation reaches the point where the subject is merged in the example (54b), the focus semantics associated with it will cause focus stress to be assigned to the subject, which then activates the rule in (55). This rule then triggers linearisation of the subject in clause-final position. In principle, there are two ways in which this last step can be obtained. Either

³⁷Which in fact I do; see also Kremers (2009), where I reach the same conclusion on different grounds.

³⁸See also Féry (2010) for additional evidence that focus is expressed as prosodic alignment in many languages.

the effect is purely phonological, with just a reordering of the phonological string, or the effect may be mediated by syntax, with the rule in (55) triggering a syntactic operation that moves the ν P or TP across the subject. The end effect is the same, with the linear order appearing as in (54b).

5.3 Intonational contours

A final area I will briefly mention here is intonation. A typical property of questions in many (if not all) languages is that they show a specific intonational contour. Often it is even possible to form a question through intonation alone:

- (56) a. John left for Rome. (L%)
 b. John left for Rome? (H%)

In English, a normal yes/no question uses inversion, but a sentence such as (56b) can be used as something like a yes/no echo question, expressing surprise and requesting confirmation. Assuming that such a clause is headed by a C head with a [+Q] feature, we can represent this head in the following way:

$$(57) \text{ INT} \leftrightarrow [C, +Q] \leftrightarrow H|_U$$

The rule in (57) states that a [+Q] C head is associated semantically with an interrogative operator and phonologically with a high tone at the right edge of an Utterance. Obviously this representation is simplified in several ways, but the idea should be clear. Intonation is represented on a separate autosegmental tier and the merger of an appropriate syntactic head triggers its inclusion in the phonological representation. The standard phonological principles then apply in order to associate the boundary tone with the rest of the phonological representation.

5.4 Summary

In morphology, the idea that a morphosyntactic head can be associated with a non-segmental, syllabic phonological structure is well-established since Goldsmith's (1976) and McCarthy & Prince's (1996) seminal works. The proposal made here is that the same idea should be adopted in syntax. There is no obvious break in the prosodic hierarchy: prosodic words are grouped into phonological phrases just as syllables are grouped into prosodic words. Therefore, any claim that syntactic heads cannot be associated with autosegmental phonological structure would be a mere stipulation. Given that this is a possibility in morphology, we would in fact expect the same to be possible in syntax.

The examples discussed in this section suggest that this expectation is borne out. Obviously, more work needs to be done in each case, but I believe the idea to be viable and potentially very fruitful. Representing the intonational rise in questions as the phonological reflex of an interrogative C head seems a very natural way to deal with this phenomenon. Similarly, the idea that a Neg head is associated with an autosegmental feature such as headshake, which is

represented autosegmentally in phonology and gets associated with the verb, seems the most straightforward way of dealing with the data.

Once one accepts this conclusion, the next step is also a natural one: by analysing the relevant data in the manner outlined here, it becomes impossible to draw a clear line between morphology and syntax. The DGS negation is a syntactic head, but its realisation on the verb appears to be a morphological effect. Deverbal noun formation in Arabic would traditionally be considered a morphological process, but we can derive the correct form directly from the syntactic tree.

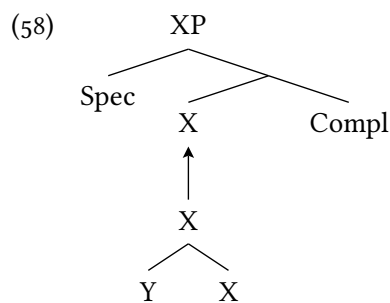
6 Counterarguments

As mentioned in the introduction, there have been many attempts to unify syntax and morphology into a single system. There are equally many criticisms of such proposals, which usually point out that there are differences between syntax and morphology that cannot be explained in a unified theory. In this section, I discuss several points that have been brought up in this discussion and show why I do not believe they pose a problem for the assumption that morphology is not a separate grammar module.

6.1 Syntactic vs. morphological word formation

Ackema & Neeleman (2007) present a number of arguments why it is empirically necessary to distinguish between a syntactic and morphological module.³⁹ They discuss several arguments that they claim speak in favour of assuming a separate word-syntax module. Most of these arguments against a synthesis of syntax and morphology, however, do not apply to the current proposal, because they argue against a type of syntactic word formation that the current proposal does not assume.

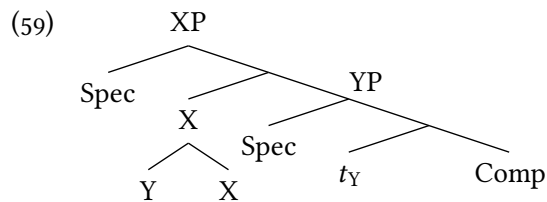
In a morphological theory of word formation, according to Ackema & Neeleman, a complex word of the form $[_X X\text{-}Y]$ has the following structure:



That is, the complex word itself is formed in the morphological module and then inserted into the syntactic structure (as indicated by the arrow), where it then projects a phrase.

³⁹More precisely, Ackema & Neeleman argue that both modules are in fact submodules of a larger macro-module that they call 'SYNTAX': this architecture, they claim, explains the fact that syntax and morphology share certain properties (i.e., heads, categories, scope phenomena, etc.) while at the same time having clear differences.

Ackema & Neeleman contrast this structure with the following, in which word formation takes place through head movement in syntax:



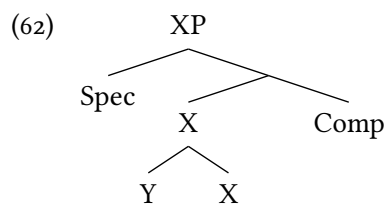
In this structure, X takes YP as its complement and Y° subsequently moves to X° , forming a complex head. This head movement analysis, Ackema & Neeleman claim, makes several predictions that are not borne out by the linguistic data. First, we would expect that the movement of Y can strand elements in YP. However, it is obvious that head movement that feeds word formation cannot do so:

- (60) a. *the [city_i centre] [of [a prosperous medieval [t_i [in Northern Italy]]]]
 b. *[parent_i hood] [(of) [a [responsible [t_i [from Glasgow]]]]]

Also, if word formation is syntactic, we would expect that deverbal nouns such as *driver* would still retain the licensing properties of the underlying verb. However, this is not the case, as witnessed by the fact that *driver* cannot take an accusative complement. Instead, it needs the preposition *of* to license a complement:⁴⁰

- (61) driver *(of) a truck

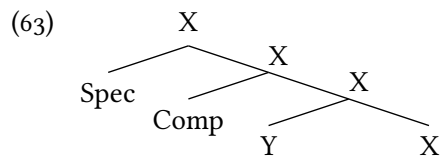
These data are not immediately problematic for the current proposal, however. What these data show is that a theory of word formation that employs syntactic movement is problematic. However, in a bare-phrase-structure approach, there is no need to assume movement. Current minimalist thinking has abandoned the X' -schema and adopted bare phrase structure, making it possible to merge two heads in syntax directly. That is, we can have a syntactic variant of the structure in (58):



In this structure, the complex head $[X\ Y-X]$ is simply formed in syntax, after which it projects in the normal manner. Note that BPS also does not make a fundamental distinction between

⁴⁰Obviously, certain deverbal nouns do retain the licensing capabilities of the underlying verb: gerunds can assign accusative case and allow adverbials. This means that we must argue that *-er* must necessarily attach low in the structure. (Reference?)

complements and specifiers, and bar levels are merely descriptive. Therefore, the structure in (62) can also be represented as in (63):



This is in fact the same kind of structure that I proposed above in section 3.1 for Arabic deverbal nouns, exemplified in (19).

Within BPS, complex heads can be formed in syntax without having to assume movement. The predictions that Ackema & Neeleman argue follow from a syntactic theory of word formation do not apply to a structure of this type. If we merge two heads directly, one of these does not project and we do not expect the non-projecting head to be able to license any dependents, let alone to be able to strand them.

6.2 Lexical integrity

It is often claimed that words are subject to some principle that makes them opaque in syntax. Usually called the *Lexical Integrity Principle* (cf. Anderson 1992), it states that the structure of words is not accessible to syntax and that constituent parts of words cannot be separated in syntax. This is taken as evidence for a separate morphology module. It is true that this would indeed be a good explanation for lexical integrity: if words are generated in a separate module, it makes sense that the syntactic module treats them as atoms.

In this section, I discuss two types of arguments against this assumption. The first type of argument questions the absoluteness of lexical integrity; the second type of argument questions whether the only way to account for the (gradual) effects that we do observe is to assume a separate morphology module. What I will argue for is that there is a general correspondence between semantic and syntactic units and that this is the root of so-called lexical integrity effects, but also of similar integrity effects at the syntactic level.

Let us first consider the question how strong a generalisation the Lexical Integrity Principle is. Booij (2009) discusses Lexical Integrity as a morphological principle and concludes:

In conclusion, this paper has shown that the principle of Lexical Integrity should be formulated in such a way as not to exclude the different modules of the grammar from ever having access to word-internal structure. Moreover, Lexical Integrity as the prohibition on syntactic manipulation of word-internal constituents is not an absolute universal, but rather the default situation. (Booij 2009)

Similarly, Lieber & Scalise (2006) state that “[...] we know that morphology and syntax interact, and that this interaction is not a one way affair: morphology sees syntax and syntax sees morphology” (p. 10). Neither Booij nor Lieber & Scalise wish to argue that Lexical Integrity should be abandoned. Rather, they claim that only a limited interaction between syntax and

morphology should be allowed, because, as Lieber & Scalise state, “[...] this possibility predicts far more interaction than we find” (p. 30). They do not, however, explain what sort of interactions we would expect. As I explain below, I believe we would not in fact expect much more interaction than what we see, because the default case is that structures are opaque for syntactic operations initiated at higher levels of structure.

Furthermore, it should be clear that any claim along the lines of those made by Booij or Lieber & Scalise requires a proper definition of the term “word”, which, as I have argued, is not unproblematic. If we cannot define “word”, then the Lexical Integrity Principle becomes meaningless. A definition of words as lexico-semantic units (i.e., lexemes) does not suffice, because particle verbs would certainly fall under that definition, even though they are separable in syntax. Nor can we define the word as indivisible units in syntax, because that would make Lexical Integrity circular.

There is in fact another reason why the latter definition will not work: there are syntactic structures to which the restriction on accessibility for operations at higher levels applies as well. Take, for example, the claim that constituent parts of words cannot be moved:

(64) *Tea_i, I have bought a t_i pot.

It is true that English does not allow the fronting of a single member of a compound. However, a similar form of subextraction is disallowed for noun phrases as well:

(65) *Blue_i, I have bought a t_i tea pot.

Why would we ascribe the impossibility of (64) to Lexical Integrity, when the apparently very similar fact in (65) cannot be ascribed to it? This question becomes even more compelling when we consider the following colloquial Russian data:

(66) *Russian* (Pereltsvaig 2008: 8, 10)

- a. Čěrnogo_i ja rešila ne pokupat’ [NP t_i xleba]!
 black I decided not to.buy bread
 ‘I decided not to buy black bread.’
- b. V vagon ona xodila restoran obedat’.
 to carriage she went restaurant to.dine
 ‘She used to go dine in a carriage restaurant.’

These Russian examples show exactly the kind of displacement that English does not allow in (64) and (65). In (66a) an attributive adjective, *čěrnogo* ‘black’ is moved from its base position inside the noun phrase to sentence-initial position. In (66b), part of a lexical compound is displaced.⁴¹ Pereltsvaig argues that the displaced element can be either a topic or a focus, the crucial aspect that enables displacement being contrastivity. For our purposes, it suffices to

⁴¹Interestingly, it has pied-piped the preposition *v* ‘in(to)’, which suggests the displacement may be phonological in nature, as it targets a phonological unit, not a syntactic unit. I will not pursue this matter here, though.

observe that displacement is possible. These data suggest that “word status” is not the decisive property that determines whether subextraction is possible or not.⁴²

I therefore propose that we replace the Lexical Integrity Principle with an equivalent principle that does not refer to the notion of word. For reasons that will become clear shortly, I formulate this principle as a correspondence principle between semantics and syntax:

(67) *Structural Integrity Principle* (SIP)

Semantic units correspond to syntactic units, and vice versa.

The SIP states that if something is a unit in semantics, either an atomic (non-decomposable) unit or a complex unit, it will correspond to a syntactic unit (a head, a phrase) and similarly, a syntactic unit will correspond to something that is a unit in semantics. The SIP is a strong but not inviolable principle of language. The displacement property of language, for example, violates it. Note, however, that the SIP will actually restrict displacement: if a syntactic element is displaced in syntax, it behaves as a syntactic unit. Therefore, the SIP requires that it corresponds to a syntactic unit. That is, we cannot randomly move elements, moved elements have to be constituents.

The violability of the SIP may give the impression that it is a meaningless principle. However, there are two factors restricting violations of the SIP. First, syntactic movement is usually triggered, which means that a violation of the SIP incurred by displacement is actually motivated, it does not take place at random. Second, we may expect that displacement is only allowed if recoverability is guaranteed: the parser needs to be able to reconstruct the base position of the displaced element.

Note that as stated above in section 3.4, recoverability should not be interpreted as a rule of grammar. Recoverability does not condition displacement directly. Displacement options are grammaticalised and are therefore subject to both general and language-specific syntactic constraints. Recoverability is not a syntactic principle, rather it is a tendency that plays a role in grammaticalisation, i.e., in the process by which the grammar of a language develops.

To illustrate this, it is quite clearly the case that recoverability is not a sufficient condition for displacement. It is not difficult to find cases that seem to pose no problem for recoverability but in which displacement is nevertheless not possible. Consider the following example:

- (68) a. Which book_i were you looking for t_i?
b. *German*
*Welch-em Buch_i hast du nach t_i gesucht?
which-DAT book have.2sg you to looked
'Which book were you looking for?'

English allows preposition stranding in *wh*-questions, German does not. Given that the structure is recoverable in English, there seems no *a priori* reason why recoverability should not be given in German, especially because German potentially has an additional cue in the form of case: in (68b), for example, the preposition *nach* ‘to, after’, is the only dative case assigner in

⁴²In fact, it is not clear how it could be, given the lack of a sound definition of the notion “word”.

the clause, leaving little doubt as to what the base position of the noun phrase *welchem Buch* ‘which book’ is.

One prediction that follows from such a non-grammatical notion of recoverability is that languages differ in which kinds of structures they allow to be split up, because different languages may provide different ways to reconstruct the base position of displaced elements. The English and German data in (68) and the English and Russian data in (64)–(66) show that this prediction is borne out.⁴³

There is one special case of the SIP that requires some consideration. The semantic and syntactic “units” mentioned in the formulation of the SIP above may be complex, but they may of course also be simplex. In the case of syntax, a simplex unit is an X° category. In semantics, a simplex unit is a concept, the basic meaning unit expressed by a lexeme. The relevant question here is what happens when the semantic and the syntactic structures do not correspond to each other in a one-to-one fashion. What happens when a semantically simplex unit corresponds to a syntactically complex unit?

One important consequence of the SIP in this case is that the syntactic unit becomes essentially opaque. The SIP requires that if a syntactic subunit is displaced, it must correspond to a semantic subunit itself. But if the semantic unit is simplex, it does not have any subunits that the displaced syntactic unit can correspond to. As a result, displacement of such a syntactic subunit becomes impossible.

Effects of this nature can be seen in Dutch and German particle verbs. In these languages, the particle of a particle verb can be fronted to clause-initial position (Zeller 2001, Lüdeling 2001, Müller 2002):

(69) *German*

- a. An der Haltestelle stiegen hübsche Frauen ein. Aus stiegen nur Männer.
at the bus.stop climbed pretty women in out climbed only men
‘At the bus stop, pretty women got on. Only men got off.’
(Zeller 2001: 89)
- b. Ich weiß, dass die Sonne AUF im Osten und UNTER im Westen
I know that the sun up in.the East and down in.the West
geht.
goes
‘I know the sun goes up in the East and down in the West.’
(Lüdeling 2001: 50)

However, such fronting is not always possible:

⁴³Note that the SIP may have an interesting consequence for the notion of islands. Ever since Ross (1967), the main question concerning islands has been why certain domains are islands for extraction. Perhaps, given the SIP, the question that we should ask ourselves is rather why certain domains are *not* islands.

- (70) a. *German*
 *Auf ist er im letzten Moment gesprungen.
 up is he in.the last moment jumped
 (Stiebels & Wunderlich 1994: 932)
- b. *Dutch*
 *dat Jan het meisje op vaak merkte.
 that Jan the girl up often noticed
 (Neeleman & Weerman 1993: 436)

As discussed by e.g., Müller (2002), fronting (and scrambling, which (70b) is a case of) of the particle is only possible if the particle's meaning is transparent, which is exactly what the SIP would predict.

Displacement is not the only syntactic operation that may be affected by the SIP. There are other syntactic processes that rely on semantics in some form or other. For example, pronominal reference has a clear semantic component, because the element being referred to must be "active" in some sense.⁴⁴ Similarly, modification, e.g., an adjective modifying a noun, is also a process that clearly depends on semantics. Such processes can only target elements that are represented both in the syntactic and in the semantic structure. That is, if a syntactically complex element corresponds to a semantically simplex element, the subparts of the syntactic element are not available for the relevant processes.

A good example of the latter case is provided by Hebrew compounds (Borer 1989, 2009). In Hebrew, the well-know *construct state* can be used to productively create N+N constructions with a transparent meaning, as demonstrated in (71a). However, there is also a sizable group of construct state N+N combinations that do not have a transparent meaning, as in (71b):

- (71) *Hebrew* (Borer 2009)
- a. beyt morá
 house.CNSTR teacher
 'the teacher's house'
- b. beyt sefer
 house.CNSTR book
 'school'

Borer calls such opaque construct states compounds and shows that they are characterised by several properties that distinguish them from transparent construct states. Most importantly from the perspective of the SIP is the fact that the meaning of the compound is nontransparent. In other words, although they are syntactically complex, semantically, they are not. Semantically, they are atomic units. As Borer shows, the nonhead in these constructions cannot be modified or coordinated and is itself nonreferential. Furthermore, pronominal reference to either just the head or just the nonhead is not possible. All of these properties follow from the fact that a compound is a semantically simplex unit.

⁴⁴This implies a broad interpretation of the term "semantics". Also, the term "active" is intentionally left vague.

The formulation of the SIP in (67) only makes reference to semantic and syntactic structure, phonology is not mentioned. I assume that the SIP does indeed hold between semantics and syntax, and does not include phonology. The relation between syntax and phonology is regulated by two principles similar to the SIP:

- (72) a. *Input Correspondence*:
If X selects (a projection of) Y, $\Phi(X)$ selects $\Phi(Y)$.
- b. *Linear Correspondence*
If a node X is structurally external to a node Y, then $\Phi(X)$ is linearly external to $\Phi(Y)$.

Input Correspondence was discussed above in section 3.1. The second principle, Linear Correspondence, is also adopted from Ackema & Neeleman (2004).⁴⁵ In essence, Linear Correspondence expresses the same intuition that Partee et al.'s (1993) *Nontangling Condition* says: if two nodes are sisters in the tree, then the phonological structures that they dominate are adjacent in the linear string.

Input and Linear Correspondence both have the same purpose, which is to keep together things that belong together. The two principles do this in different ways: Linear Correspondence is only sensitive to the hierarchical relations in the syntactic tree, while Input Correspondence looks at the selectional relations.⁴⁶

Note that in most cases, the mapping from syntax to phonology produces a straightforward result with sister nodes ending up adjacent in the linear string, in accordance with Linear Correspondence. Although there are cases where this straightforward correspondence between hierarchical and linear structure is obscured, they are a relative minority. This means that in general there is also a correspondence between semantic and phonological structure, in the sense that semantic units are realised as phonologically adjacent strings. Obviously, this correspondence is indirect, and it is not perfect, since both in the semantics-syntax mapping and in the syntax-phonology mapping, disruptions may occur, but by and large, there is a correspondence between semantics and phonology.

The phonology brings in another aspect that requires discussion. In the semantics, there is an –admittedly intuitive– notion of what a simplex unit is: a simplex unit is a concept. In syntax, the notion of simplex unit is quite clear: it is the X° head. In phonology, things are rather different. The segmental tier offers us segments and the prosodic hierarchy offers us several different prosodic constituents. The question then becomes which phonological element corresponds to syntactic heads and indirectly to semantic concepts.

Theoretically, any element will do, of course. In reality, there are some practical considerations. Single segments will not do, because their number is far too small to cover the wide range of meanings that the conceptual system can represent. Syllables already offer a better possibility, especially given the fact that they can be augmented with tone. Languages such

⁴⁵As with Input Correspondence, however, a similar principle has been proposed by Sadock (1992).

⁴⁶It would in fact be interesting if Linear Correspondence could be reduced to Input Correspondence. There seems to be some basis for doing this, since sisterhood relations usually underlie some form of selection (with the exception of adjuncts, at least in mainstream minimalist approaches). I will not discuss the matter here, but see Kremers (in press) for a view on linearisation that would be required.

as Chinese seem to have chosen this option, expressing a substantial basic vocabulary with monosyllabic phonological structures.

Most languages, however, appear to choose a different option: the prosodic word. The prosodic word is large and flexible enough to allow for a large set of distinguishable forms, allowing the expression of a wide range of meanings. Larger constituents in the prosodic hierarchy would theoretically also be an option, but there seems no reason to consider this if prosodic words provide the necessary flexibility.

The result is then that by and large, semantic concepts correspond to prosodic words. The correspondence is by no means perfect, but it is strong enough to give us the impression that structures at this prosodic level are fundamentally different than structures at higher prosodic levels. This, however, is only a superficial impression, caused by the interplay of several factors. It is not a fundamental property of the linguistic system.

A remark about functional elements is in order here. I have assumed that the simplex units in semantics are concepts and I have argued that in many languages these indirectly correspond to prosodic words. However, this correspondence only applies to content words. Functional elements still correspond to syntactic heads, but in phonology they tend to correspond to smaller units, syllables, parts of syllables or even just single segments. The Strict Layer Hypothesis requires these to be incorporated into prosodic words, and if the location where they are incorporated is always the same (e.g., the head of the projection they select), then the impression of a morphological process is created.

It could be argued that compounds present a clear and obvious counterexample to the claim that semantic concepts correspond to prosodic words. Obviously, compounds usually consist of two (or more) prosodic words. Note, however, that I do not claim that concepts *must* correspond to prosodic words, just that given the SIP and given the correspondence principles between syntax and phonology, they often do. There is no necessity that they do, however.

In a different way, compounds actually confirm the proposal that I make: once a compound obtains idiosyncratic, non-predictable meaning components, they become semantically opaque and as a result, they also become syntactically inert. Note, however, that this does not mean that we expect semantically transparent compounds to be syntactically more flexible. Linguistic utterances are not just concatenations of semantic units. An utterance is licensed, so to speak, by the syntactic structure underlying it and it is this syntactic structure that allows or disallows specific syntactic operations. That is, it is not the particular compound itself that is inert, it is the structure underlying compounds in the language in question that is inert.

6.3 Properties of morphological structures

Another line of argumentation in defence of a separate morphology module focusses on the properties that morphological structures have and in which they differ from syntactic structures. An often heard argument is for example that even though there are languages with so-called “free word order” syntax, there are no languages with “free affix order” morphology. Similarly, there is no morphological equivalent to the displacement property of syntax.

Such arguments, however, are based on an overly simplistic comparison between syntax and morphology. It is to my knowledge true that there are no languages that have something like free affix order morphology. However, free word order syntax arises in languages that exploit

word order primarily for expressing information structure. Such a need does not exist among sets of affixes. Affixes are generally functional in nature, realising inflection or derivation, domains in which information structure does not exist. As a result, affix ordering cannot be affected by it. The same remarks apply to the lack of displacement in morphology. The triggers of displacement in syntax are often also information-structural in nature, or they have semantic effects of a different kind, e.g., clause-typing in V2 languages, *wh*-marking, etc. Such semantic processes are not relevant for affixes, which is why we would not expect them to be able to move.

Note, by the way, that if an affix *were* to move, we probably would not recognise it as such. If an affix moves within the word (that is, it is still phonologically connected to the prosodic word it is semantically related to), then we would consider it not a case of movement but a case of alternative affix ordering (which may, depending on one's theory of word formation, be the result of movement, but typically this will be movement of the lexical head, not of the affix). If an affix moves out of the word, we would consider it a *syntactic* movement. Either way, we would not be inclined to call such a phenomenon "morphological movement". Even here, then, our preconceptions about the syntax/morphology distinction colour our perception of the data.

Several more specific claims about differences between syntactic and morphological structures are discussed by Ackema & Neeleman. Ackema & Neeleman claim that both syntax and morphology may form complex heads. A morphological complex head is what we traditionally think of as a complex word, while a syntactic complex head is for example a verb complex. Ackema & Neeleman claim that the two types of heads have different properties, a fact that can only be accounted for by assuming a separate morphology module.

First, Ackema & Neeleman argue that syntactic complex heads show the headedness that syntactic structures in general show in the language under discussion, while headedness in morphological complex may be in the other direction. In English, syntactic structures are generally head-initial (VO, P-DP, D-NP, etc.) Particle verbs are also head-initial (*to sit down*, not **to down sit* or *down to sit*), while English morphology is quite generally head-final (i.e., right-headed).

However, we also see syntactic complex heads whose headedness differs from what is generally the case in the language at hand. Verb clusters in Dutch, for example, can be left-headed, even though verbs in general are assumed to be right-headed. Citing an example from Ackema & Neeleman (2007: 338) themselves:⁴⁷

- (73) ... dat hij de diamant [ziet [fonkelen]]
 that he the diamond [sees [sparkle.INF]]
 '... that he sees the diamond sparkle.'

The head of the verb cluster *ziet fonkelen* is the finite verb *ziet*, yet it precedes its complement.⁴⁸ Of course, Dutch morphological structures are also overwhelmingly right-headed, so

⁴⁷German verb clusters can also be head-initial, though only in a limited set of contexts, unlike Dutch, where verb clusters generally have this ability. In fact, the head-initial structure is often preferable over the head-final equivalent.

⁴⁸Note that this does not depend on the fact that *ziet* is finite. An infinitival verb would have the same word order: *Hij kann de diamant niet zien fonkelen* 'he can the diamond not see sparkle'.

the argument here is not that, contrary to Ackema & Neeleman's claim, *ziet fonkelen* is morphological. Rather the argument is that deviation from the usual syntactic headedness pattern is not limited to morphological complex heads.

The second property that Ackema & Neeleman discuss is the observation that syntactic complex heads cannot be the input to complex predicate formation, while morphologically complex heads can:

- (74) a. *Ik geloof dat Jan en Piet zich [kapot [samen werken]]
 I believe that Jan and Piet SE [to-pieces [together work]]
 'I believe that Jan and Piet cooperate so much that it exhausts them.'
- b. ... dat Jan zich [suf [stijl danst]]
 that Jan SE [drowsy [style dances]]
 '... that Jan ballroom-dances so much that he becomes drowsy.'

Samenwerken in (74a) is a particle verb, which Ackema & Neeleman assume to be syntactic. The example shows that this verb cannot be the basis for a resultative construction (cf. *zich kapot werken* 'SE to-pieces work', i.e., 'to work oneself to pieces'.) On the other hand, a compound verb such as *stijldansen* 'to ballroom dance' in (74b) can be the basis for a resultative construction.

However, as Müller (2002) discusses, particle verbs and resultative constructions have a lot of properties in common. So much so, even, that it is conceivable that they are in fact two instantiations of the same type of structure. If this is indeed the case, it could well be that the particle and the resultative compete for the same structural position, which would account for the unacceptability of (74a). The compound verb in (74b), however, has a different structure than the particle verb so that no conflict arises in combination with the resultative.

The third of Ackema & Neeleman's differences between syntactic and morphological complex heads is that syntactic complex heads allow elements as non-head constituents that are not allowed as non-heads in morphological complex heads. They give two examples from Dutch: first, infinitives marked with *te* 'to' are not allowed in morphological complex heads, e.g., the compound in (75a), but they do appear in syntactic complex heads, e.g., the verb cluster in (75b):

- (75) a. (*te) staan plaats
 (*to) stand place
 'standing room'
- b. ... dat hij haar heeft [proberen te verstaan]
 that he her has [tried to understand]
 '... that he has tried to understand her'

Second, in compounds verbs typically appear in their stem form, whereas verbs in syntactic complex heads must always be inflected:

- (76) a. [fonkel (*en)] nieuw
 [sparkle (*INF)] new
 ‘brand new’
- b. ... dat hij de diamant [ziet [fonkel-*(en)]]
 that he the diamond [sees [sparkle-*(INF)]]
 ‘... that he sees the diamond sparkle.’

However, it is not the case that verbs in compounds *always* appear in their stem form. This is already clear from the example in (75a): in *staanplaats* ‘standing room’, the verb *staan* ‘to stand’ appears in its infinitival form. Other languages show even more extreme cases: Nahuatl, for example, allows inflected verb forms as non-head members of certain verbal compounds:

- (77) *Tlen quihtoznequi?*
 tlen ∅- qui- hto- z- nequi
 what 3sg.SUBJ 3sg.OBJ say FUT want
 ‘What does it want to say?’ i.e., ‘What does it mean?’

In this example, the verb *nequi* ‘to want’ incorporates the inflected verb *quihtoz*, which consists of *-hto-*, the root of the verb (*i)htoa* ‘to say’, the 3sg object prefix *qui-*, the future marker *-z* (which attaches to the root) and a phonologically null subject prefix. The whole incorporated verb structure *quihtoznequi* must be considered a “morphological” unit, since the verb *nequi* is transitive and therefore requires the presence of an object prefix, which can only be omitted if the verb incorporates its object.

If it is possible to incorporate a conjugated verb into a morphological structure, the clear distinction that Ackema & Neeleman argue for between syntactic and morphological complex heads becomes blurry. While it still seems to be a correct generalisation (at least for Dutch), that verbs in syntactic structures (and hence also in syntactic complex heads) must always be inflected, this may simply be the result of other factors. Utterances are generally embedded in a functional layer that anchors the utterance in the discourse, by establishing such things as speech and event time, aspect, clause type, etc. Verb inflection is one of the formal methods that performs this anchoring. If a language uses verb inflection in this manner, it stands to reason that a verb that heads an extended projection, i.e., a clause, is inflected.

I do not wish to argue that the generalisations that Ackema & Neeleman (2007) discuss are invalid. The point is that they are not as absolute as they would like and that therefore an account in terms of a distinct morphology module is not desirable. A better account is to assume only a single module and that this module can either merge bare lexical heads, or it can merge lexical heads with functional material and only then add additional lexical heads (or projections) into the structure. The first type of structures will yield “morphological” structures when mapped onto phonology.⁴⁹ The second type of structures is more likely to be mapped onto phonological structures that are classified as “syntactic”, although that seems to be a language-dependent property, as the case of polysynthetic languages shows.

⁴⁹In the common case, at least. It cannot be excluded *a priori* that sometimes such structures map onto phonological structures that we would classify as syntactic, or that we find difficult to classify. Structures such as *book reading* or in German *Bücher lesen* ‘books read.INF’ come to mind.

Given that the two types of structures differ syntactically, it is possible that they have different properties arising from those syntactic differences. That is, we cannot exclude the possibility that a particular language linearises structures of the type $[X X Y]$ in one way if X and Y are both lexical roots and in another way if X is functional. Nor is it unexpected if a language allows some types of functional structures to merge with bare roots (e.g., *staanplaats* ‘standing room’), while disallowing others (i.e., **te staanplaats*). Such facts are simply properties of the grammars of particular languages and follow from general tendencies in language development combined with historic accident.

7 Summary and conclusions

In this paper, I argue that the grammar of human language does not include a separate morphology module. Rather, there is only one module responsible for the linking between form (phonology) and meaning (semantics), which I call “syntax”. The empirical differences between what are traditionally called syntactic and morphological structures can be explained if we take into account the contribution that the phonological module makes to the construction of linguistic forms. In essence, the syntax/morphology distinction is an acoustic illusion: a syntactic structure that is mapped onto a prosodic word is generally considered to be “morphological”, while a syntactic structure that is mapped onto phonological phrases is considered “syntactic”. In reality, however, the structure-building mechanism is the same.

The syntax/morphology illusion is strengthened by the fact that semantically simplex units (concepts) tend to correspond to prosodic words. This, however, is not a deep property of the language faculty. Rather, it is the result of the combination of two facts: (a) semantic units tend to be realised as syntactic units; and (b) syntactic heads tend to be realised as prosodic words. Both these facts are interface effects: if semantic units would not correspond to syntactic units, it would be impossible to encode any complex meaning in a reliable, reconstructable manner. Similarly, the prosodic word is the lowest constituent of the prosodic hierarchy that can provide enough forms to accommodate the wide variety of concepts that the semantic system provides.

The view of the architecture of grammar sketched in this paper has interesting consequences for a range of phenomena. First and foremost, it suggests that the ideas behind prosodic morphology can and must be extended to syntax as well. This opens the way to new analyses of phenomena such as linearisation, focus alignment, intonation, and probably others. Furthermore, I have identified a number of properties that we may plausibly consider third-factor effects: properties that are not formalised as part of UG or of the grammar of a language (i.e., an I-language) and which therefore have no direct influence on derivations. They do, however, have an influence on the development of an I-language and can thus shape the grammar of a language, albeit indirectly.

References

Abels, Klaus & Ad Neeleman. 2009. Universal 20 without the LCA. In José M. Brucart, Anna Gavarro & Jaume Sola (eds.), *Merging features*, chap. 4, 60–79. Oxford: Oxford University Press. URL <http://ling.auf.net/lingBuzz/000279>.

- Abney, Steven. 1987. *The English noun phrase in its sentential aspect*. Ph.D. thesis, MIT. MIT Working Papers in Linguistics.
- Ackema, Peter. 1995. *Syntax below zero*. Ph.D. thesis, Utrecht Research Institute for Language and Speech OTS.
- Ackema, Peter & Ad Neeleman. 2004. *Beyond morphology: Interface conditions on word formation*. Oxford: Oxford University Press.
- Ackema, Peter & Ad Neeleman. 2007. Morphology \neq syntax. In Gillian Ramchand & Charles Reiss (eds.), *The Oxford handbook of linguistic interfaces*, chap. 10, 325–352. Oxford: Oxford University Press.
- Agbayani, Brian & Chris Golston. 2010. Second-position is first-position: Wackernagel's Law and the role of clausal conjunction. Ms. California State University, Fresno.
- Anderson, Stephen R. 1992. *A-morphous morphology*. Cambridge: Cambridge University Press.
- Beard, Robert. 1988. On the separation of derivation from morphology: Toward a lexeme/morpheme-based morphology. *Quaderni di Semantica* 9. 3–59.
- Booij, Geert. 2009. Lexical integrity as a morphological universal: A constructionist view. In Sergio Scalise, Elisabetta Magni & Antonietta Bisetto (eds.), *Universals of language today*, 83–100. Berlin: Springer.
- Borer, Hagit. 1989. On the morphological parallelism between compounds and construct. In Geert Booij & Jaap van Marle (eds.), *Yearbook of morphology 1*. Dordrecht: Foris.
- Borer, Hagit. 2009. Afro-asiatic, semitic: Hebrew. In Rochelle Lieber & Pavol Stekauer (eds.), *The Oxford handbook of compounding*. Oxford: Oxford University Press. URL <http://www-bcf.usc.edu/~borer/borer%202008.pdf>.
- Chomsky, Noam. 1965. *Aspects of the theory of syntax*. Cambridge, MA: The MIT Press.
- Chomsky, Noam. 1995. *The minimalist program*. Cambridge, MA: The MIT Press.
- Chomsky, Noam. 2001. Derivation by phase. In Michael Kenstowicz (ed.), *Ken Hale: A life in language*. Cambridge, MA: The MIT Press.
- Chomsky, Noam. 2008. On phases. In Robert Freidin, Carlos Otero & Maria-Luisa Zubizarreta (eds.), *Foundational issues in linguistic theory*, 133–166. Cambridge, MA: The MIT Press.
- Christophe, Anne, Séverine Millotte, Savita Bernal & Jeffrey Lidz. 2008. Bootstrapping lexical and syntactic acquisition. *Language and Speech* 51(1). 61–75.
- Culicover, Peter & Ray Jackendoff. 2005. *Simpler syntax*. Oxford: Oxford University Press.
- Embick, David & Rolf Noyer. 2001. Movement operations after syntax. *Linguistic Inquiry* 32(4). 555–595.

- Erteschik-Shir, Nomi & Lisa Rochman (eds.). 2010. *The sound patterns of syntax*. Oxford: Oxford University Press.
- Fassi Fehri, Abdelkader. 1993. *Issues in the structure of Arabic clauses and words*, vol. 29, Studies in Natural Language and Linguistic Theory. Dordrecht: Kluwer Academic Publishers.
- Féry, Caroline. 2010. Focus as prosodic alignment. URL <http://www.uni-koeln.de/phil-fak/ids1/linguistik/workshops/>. Talk at the Cologne International Workshop On Prosody, 3 July, 2010.
- Fox, Danny & David Pesetsky. 2005. Cyclic linearization of syntactic structure. *Theoretical Linguistics* 31(1-2). 1-46.
- Freidin, Robert. 2003. Shaky foundations – review of ray jackendoff’s *Foundations of Language: Brain, Meaning, Grammar, Evolution*. *Glott International* 7(7/8).
- Goldsmith, John. 1976. *Autosegmental phonology*. Ph.D. thesis, Cambridge, MA: The MIT Press.
- Goldstein, Louis, Dani Byrd & Elliot Saltzman. 2006. The role of vocal tract gestural action units in understanding the evolution of phonology. In Michael A. Arbib (ed.), *From action to language via the mirror neuron system*, 215-249. Cambridge: Cambridge University Press.
- Greenberg, Joseph Harold. 1966. Some universals of grammar with particular reference to the order of meaningful elements. In Joseph Harold Greenberg (ed.), *Universals of language*, 73-113. Cambridge, MA: The MIT Press. 2nd ed.
- Halle, Moris & Alec Marantz. 1993. Distributed morphology. In Kenneth Hale & Samuel Jay Keyser (eds.), *The view from Building 20: Essays in linguistics in honor of Sylvain Bromberger*, chap. 3, 111-176. Cambridge, MA: The MIT Press.
- Haspelmath, Martin. 2011. The indeterminacy of word segmentation and the nature of morphology and syntax. *Folia Linguistica* 45(1). 31-80.
- Hauser, Marc, Noam Chomsky & W. Tecumseh Fitch. 2002. The faculty of language, what is it, who has it, and how did it evolve? *Science* 298. 1569-1579.
- Hawkins, John A. & Gary Gilligan. 1988. Prefixing and suffixing universals in relation to basic word order. *Lingua* 74. 219-259.
- Inkelas, Sharon. 1989. *Prosodic constituency in the lexicon*. Ph.D. thesis, Stanford University.
- Inkelas, Sharon & Draga Zec (eds.). 1990. *The phonology-syntax connection*. Chicago: University of Chicago Press.
- Jackendoff, Ray. 1997. *The architecture of the language faculty*, vol. 28, Linguistic Inquiry Monograph. Cambridge, MA: The MIT Press.
- Jackendoff, Ray. 2002. *Foundations of language: Brain, meaning, grammar, evolution*. Oxford: Oxford University Press.

- Kayne, Richard. 1994. *The antisymmetry of syntax*. Cambridge, MA: The MIT Press.
- Kremers, Joost. 2007. Masdar formation. In Harald Motzki & Everhard Ditters (eds.), *Approaches to Arabic linguistics*, Studies in Semitic Languages and Linguistics, 475–499. Leiden: Brill.
- Kremers, Joost. 2009. Recursive linearization. *The Linguistic Review* 26(1). URL <http://user.uni-frankfurt.de/~kremers/research.html>.
- Kremers, Joost. in preparationa. Arabic deverbal nouns: A case of phonological head movement. Ms. University of Göttingen.
- Kremers, Joost. in preparationb. Morphology and syntax and the phonology interface. Post-doctoral thesis, University of Göttingen.
- Kremers, Joost. in press. Linearization as repair. To appear in: Patrick Brandt & Eric Fuß, *Repair*.
- Kremers, Joost. submitted . The syntax of simultaneity. Ms. University of Frankfurt.
- Lieber, Rochelle. 1992. *Deconstructing morphology: Word formation in a syntactic theory*. Chicago: University of Chicago Press.
- Lieber, Rochelle & Sergio Scalise. 2006. The Lexical Integrity Hypothesis in a new theoretical universe. *Lingue e Linguaggio* 6. 7–32.
- Lüdeling, Anke. 2001. *On particle verbs and similiar constructions in German*. Stanford, CA: CSLI Publications.
- McCarthy, John & Alan Prince. 1990. Prosodic morphology and templatic morphology. In Mushira Eid & John McCarthy (eds.), *Perspectives on Arabic linguistics ii*, vol. 72, Current Issues in Linguistic Theory, 1–54. Amsterdam/Philadelphia: John Benjamins.
- McCarthy, John & Alan Prince. 1993. Generalized alignment. *Yearbook of Morphology* 79–154.
- McCarthy, John & Alan Prince. 1996. Prosodic morphology 1986. Ms. University of Massachusetts, Rutgers University.
- Müller, Stefan. 2002. Syntax or morphology: German particle verbs revisited. In Nicole Dehé, Ray Jackendoff, Andrew McIntyre & Silke Urban (eds.), *Explorations in verb-particle constructions*, 119–139. Berlin: Mouton de Gruyter.
- Nam, Hosung. 2007. Syllable-level intergestural timing model: Split-gesture dynamics focusing on positional asymmetry and moraic structure. In Jennifer Cole & José Ignacio Hualde (eds.), *Laboratory phonology 9*, 483–506. New York: Mouton de Gruyter.
- Neeleman, Ad & Fred Weerman. 1993. The balance between syntax and morphology: Dutch particles and resultatives. *Natural Language and Linguistic Theory* 11. 433–475.

- Nespor, Marina, Shukla Mohinish, Ruben van de Vijver, Cinzia Avesani, Hanna Schraudolf & Caterina Donati. 2008. Different phrasal prominence realizations in VO and OV languages. *Lingue e Linguaggio* 7(2). 139–168. URL <http://hdl.handle.net/10281/6919>.
- Nespor, Marina & Irene Vogel. 1986. *Prosodic phonology*. Dordrecht: Foris.
- Nunes, Jairo. 2004. *Linearization of chains and sideward movement*. Cambridge, MA: The MIT Press.
- Nunes, Jairo & Juan Uriagereka. 2000. Cyclicity and extraction domains. *Syntax* 3(1). 20–43.
- Partee, Barbara, Alice ter Meulen & Robert Wall. 1993. *Mathematical methods in linguistics*. Dordrecht: Kluwer.
- Pereltsvaig, Asya. 2008. Split phrases in colloquial Russian. *Studia Linguistica* 62(1). 5–38.
- Pfau, Roland. 2001. Typologische und strukturelle Aspekte der Negation in Deutscher Gebärdensprache. In Helen Leuninger & Karin Wempe (eds.), *Gebärdensprachlinguistik 2000: Theorie und Anwendung*, vol. 37, Internationale Arbeiten zur Gebärdensprache und Kommunikation Gehörloser. Hamburg: Signum. Vorträge vom Symposium “Gebärdensprachforschung im deutschsprachigen Raum”, Frankfurt a.M., 11.–13. Juni 1999.
- Pfau, Roland. 2002. Applying morphosyntactic and phonological readjustment rules in natural language negation. In Richard Meier, Kearsy Cormier & David Quinto-Pozos (eds.), *Modality and structure in signed and spoken languages*, chap. 11, 263–295. Cambridge: Cambridge University Press.
- Pfau, Roland. 2008. The grammar of headshake: A typological perspective on German Sign Language negation. *Linguistics in Amsterdam* 1. 34–71.
- Pfau, Roland & Josep Quer. 2002. V-to-Neg raising and negative concord in three sign languages. *Rivista di Grammatica Generativa* 27. 73–86.
- Prince, Alan & Paul Smolensky. 2004. *Optimality theory: Constraint interaction in generative grammar*. Malden, Mass.: Blackwell.
- Richards, Marc. 2004. *Object shift and scrambling in North and West Germanic: A case study in symmetrical syntax*. Ph.D. thesis, University of Cambridge.
- Richards, Norvin. 2006. Beyond strength and weakness. URL <http://ling.auf.net/lingBuzz/000325>. Ms. Boston, MIT.
- Richards, Norvin. 2010. *Uttering trees*. Cambridge, MA: The MIT Press.
- Ross, John Robert. 1967. *Constraints on variables in syntax*. Ph.D. thesis, Cambridge, MA: The MIT Press.
- Sadock, Jerrold M. 1992. *Autolexical syntax*. Chicago: University of Chicago Press.

- Samek-Lodovici, Vieri. 2005. Prosody-syntax interaction in the expression of focus. *Natural Language and Linguistic Theory* 23. 687–755.
- Selkirk, Elizabeth. 1981. On prosodic structure and its relation to syntactic structure. In Thorstein Fretheim (ed.), *Nordic prosody II*, 111–140.
- Selkirk, Elizabeth. 1982. *The syntax of words*. Cambridge, MA: The MIT Press.
- Selkirk, Elizabeth. 1984. *Phonology and syntax: The relation between sound and structure*. Ph.D. thesis, Cambridge, MA: The MIT Press.
- Selkirk, Elizabeth. 1995. Sentence prosody: Intonation, stress and phrasing. In John A. Goldsmith (ed.), *The handbook of phonological theory*. Cambridge, MA: Blackwell.
- Siebert, Susann. 1999. *Wortbildung und Grammatik: Syntaktische Restriktionen in der Struktur komplexer Wörter*. Tübingen: Max Niemeyer Verlag. (“Word Formation and Grammar: Syntactic Restrictions in the Structure of Complex Words”).
- Smith, Jennifer L. 2011. [+wh] complementizers drive phonological phrasing in Fukuoka Japanese. *Natural Language and Linguistic Theory* .
- Stiebels, Barbara & Dieter Wunderlich. 1994. Morphology feeds syntax: The case of particle verbs. *Linguistics* 32. 913–968.
- Truckenbrodt, Hubert. 1995. *Phonological phrases: Their relation to syntax, focus and prominence*. Ph.D. thesis, Cambridge, MA: The MIT Press.
- Uriagereka, Juan. 1999. Multiple spell-out. In Samuel Epstein & Norbert Hornstein (eds.), *Working minimalism*, 251–282. Cambridge, MA: The MIT Press.
- Zec, Draga & Sharon Inkelas. 1990. Prosodically constrained syntax. In Inkelas & Zec (1990), 365–378.
- Zeller, Jochen. 2001. *Particle verbs and local domains*. Amsterdam/Philadelphia: John Benjamins.