On exceptional stress assignment in Latvian: the case of prefixes

Antonio Fábregas[I], Martin Krämer[I] & Anna Vulāne[II]
[I]UiT – The Arctic University of Norway, [II]RPIVA

ABSTRACT. In this article, we examine some previously understudied exceptions to the generalisation that Latvian assigns stress to the left-most syllable in a prosodic word, specifically those that involve prefixation. We will show that these apparent exceptions in stress assignment follow from the internal structural properties of the word, and are a result of attaching the prefix outside the domain where stress is assigned, which is up to the first functional head inside the hierarchy. Our treatment combines the syntactic structure of a neoconstructionist approach to word formation with an OT formalisation at the phonological level.

Keywords: stress, prosodic word, prefix, negation, degree, quantification

1. Introduction

Main stress at the word level in Latvian is fixed at the left edge of the word (e.g., Endzelīns 1922, Gāters 1977, Steinbergs 1977, Eckert et al. 1994, Mathiassen 1997, Holst 2001, Prauliņš 2012). However, there are some prefixed words in which stress is on the second syllable (Endzelīns 1922, Gāters 1977, Steinbergs 1977, Eckert et al. 1994, Mathiassen 1997, Holst 2001, Prauliņš 2012), or even on the third (Eckert et al. 1994). These facts are stated in all descriptions of Latvian, but to our knowledge there is no explanatory analysis of these exceptions to the general stress rule yet.

2. The data

In this section, we will give an overview of the relevant facts. We will first show that Latvian word stress is regularly assigned to the left-most syllable at the word level. In contrast, phrasal stress is final (§2.1). Once we have presented these facts, in §2.2 we move to a number of exceptions to the first generalisation: words in which stress is non-initial (§2.2). For reasons of space, here we concentrate only on exceptions involving a prefix.

2.1. The 'regular' assignment of stress in Latvian

Latvian word stress regularly falls on the first syllable, as illustrated in (1) with, respectively, a noun (1a), an adjective (1b) and a verb (1c).[1]

(1) a. ˈpa.va.sa.ris 'spring'
     b. ˈe.le.gants   'elegant'   ˈsar.ka.nīgs 'reddish'
     c. ˈkla.si.fi.cēt   'classify'   ˈga.ta.vot 'prepare'

Among the historical reasons for this pattern, it is usually mentioned (cf. Thomason & Kaufman 1992: 120-123) that the Uralic language Livonian, which, just as Hungarian and Karelian, had fixed initial stress, might have exerted an influence on Latvian. The existence and placement of secondary stress within words in Latvian is a matter of debate and since it is not relevant here we refer to the discussion in Kariņš (1996).

As for stress in compounds, it is also regularly assigned to the first syllable (Endzelīns 1922:17, 1951):

(2) a. ˈliel.-die.nas   'Easter'
     b. ˈdiv.-des.mit   'twenty'
     c. ˈgal.vas.-se.ga   'head-gear'

       d. ˈdar.ba.-vie.ta   'workplace'
       e. ˈve.cā.-mā.te   'grandmother'

At the phrasal level, the last word usually receives more stress. "In general, the first word of a sentence is lightly stressed and the final word has a stronger stress." (Prauliņš 2012: 19) Phonological phrasing generally matches syntactic structure, as exemplified in the examples in (3).

(3) Right edge oriented phrasing
      a.   ˈ**An**na ˈlasa ˈ<u>**grā**</u>matu.   'Anna is reading a book.' 'Anna is
      b.   ˈ**An**na ˈlasa ˈgrāmatu ˈ<u>**dār**</u>zā.   reading a book in the garden.'

As Prauliņš (2012:19) notes, "[i]n compound sentences this stress pattern applies to each clause, not including conjunctions".

(4)   ˈ**Va**kar ˈbiju ˈ<u>**ie**</u>pirkties (bet ˈ**maz** ko ˈ<u>**no**</u>pirku).
       'I went shopping yesterday (but didn't buy anything much).'
       //.. bet ˈ**maz** ko ˈnopirku. .. bet ˈmaz ko ˈ**no**pirku.

However, as we indicated in the introduction, there are exceptions to word level stress, to which we turn in the following subsection.

2.2. Exceptions to regular stress in prefixed words

There are, however, several counterexamples to the generalisations noted above, and in this article, we concentrate on those noted in the literature for word formation involving prefixes. Here we will present some facts, on the basis of which we will argue that the right generalisation that emerges is the one stated in (5):

(5)   When the prefix attaches above a functional head, stress is not attracted.[2]

2.2.1. Negation
Latvian negation is prefixal in the sense that it is manifested through a bound form that attaches to the left of the base. With negation, we find a contrast between lexical and functional categories: the prefix *ne-* attracts stress when it combines with verbs, adjectives and nouns, but in combination with functional items like pronouns and deictic adverbs expressing time and place built over wh-elements (question words), stress is never manifested in the prefix.
Consider first cases in which negation combines directly with a lexical category. In such forms, stress is assigned, regularly, to the first syllable, which in this case is the prefix itself.

(6) a. ˈnedot   'not to give'   neg+verb
      b. ˈnepatikt   'dislike'   neg+verb
      c. ˈnenorunāt   'don't arrange'   neg+verb
      d. ˈnelaimīgas   'unhappy, miserable, sad'   neg+ adjective (pl. fem.)
      e. ˈnezināt   'not to know'   neg+verb

We are dealing with an instance of constituent negation, in which the negative operator cannot take scope outside the base to which it attaches. Thus, (6a) denies directly the action of giving, while (6b) denies the state of liking, expressing its opposite. In (6c) the scale of the

adjective is reverted (Kennedy 1999), so that its standard value defines as falling into the class of objects included in the extension of the adjectives only those that are below what is considered pleasant in the context.

Contrast this with the stress pattern that is found whenever the base of the prefix is a functional and not a lexical item:

(7)   a. neˈkas   'nothing'
        b. neˈkāds   'none'
        c. neˈviens   'no one, nobody'
        d. neˈkad   'never'
        e. neˈkur   'nowhere'

These negative words are morphologically built by attaching the negative prefix to the bases in (8), adverbs, determiners or pronouns which can be used as pronouns or wh-elements, among other functions.

(8)   a. kas   'that, what'
        b. kāds   'what, somebody, anybody'
        c. viens   'one, single' and 'someone'
        d. kad   'when, while'
        e. kur   'where'

The distinction, we argue, is between a lexical element and a functional element, with wh-words and determiners falling into the second class. In this respect, it is illuminating to consider adverbs. Adverbs, famously, constitute an eclectic grammatical category, the subtypes of which are sharply different. If we compare (7b) with (9), we see that in the second case stress is regularly attracted by the prefix.[3]

(9)   ˈnetipiski   'atypically, indistinctive'

(9) has a lexical base: the adverb is *typically (tipiski)*, which displays the prototypical properties of lexical categories: it conveys conceptual meaning denoting notions of the real world, it belongs to an open class and it cannot be used as a grammatical marker of, say, clause type. In contrast, (8b), also an adverb in very general terms, is clearly a functional category belonging to a closed class and used to mark a sentence as interrogative.

There are even other minimal pairs (Eckert et al. 1994: 279):

(10)   a. ˈnebūt   'not to be'
        b. neˈbūt   'not at all'

In the first case, the negation is attached to a verb–albeit one with poor semantics–, and stress is regularly assigned to the first syllable. In the second case, the resulting expression is semantically a quantifier, i.e., a functional category. And in accordance with the principle that we have identified earlier in this section, the prefix does not receive stress.

2.2.2. Degree and quantification morphology

Another systematic exception to the regular stress rule in Latvian is the morpheme *pus-*, which means 'half' and can be used to convey degree, quantity and even attach to numerals. When the prefix combines with numerals, stress is not attracted.

(11)   pusˈuotrs   'one and a half'   pus+numeral
       pusˈviens   (12:30)
       pusˈdivi   (13:30)

However, when the same morpheme combines with an adjective or noun, it does attract stress.

(12)   a. ˈpusdiena 'midday'   pus+noun
       b. ˈpusnakts 'midnight'   pus+noun
       c. ˈpusdzīvs 'half dead'   pus+adjective

This is, again, an asymmetry between functional and lexical categories. The prefix only fails to attract stress when combined with numerals, which belong to the general class of quantifiers. Quantifiers are operators that suspend or affect the reference of other elements, which act as their variables; as such, they are functional elements.

The same asymmetry between lexical and functional category is found with the universal quantifier[4] expressed by *ik-*. With pronouns (14), the prefix does not attract stress.

(13)   a. ikˈviens   'everyone' (lit. every + one)
       b. ikˈkatrs   'everyone' (lit. every + each/every)

However, when it attaches to lexical nouns, it does receive the regular stress pattern.

(14)   a. ˈikdiena   'normal day'
       b. ˈikdienišķs   'everyday'

The situation is, on the surface, a bit more complex in the case of the prefix *vis-*. This affix is productively used, attached to adjectives and adverbs to convey the superlative degree. In all these cases, even though it attaches to an adjective –which is in principle a lexical category– stress assignment does not fall on the prefix (Prauliņš 2012:17):

(15)   a. visˈkarstākais   'hottest'
       b. visˈskaistākais   'most beautiful'
       c. visˈtālāk (adv.)   'furthest'

It is thus an apparent exception to the generalisation that prefixes do not attract stress when attached to functional categories. However, they are just apparent exceptions, we argue. For this, we need to look a bit deeper into the cross-linguistic properties of superlatives in contrast to a modifier like *half-*.

Superlative is an operator that is introduced in a phrase built above the functional category of degree, not the lexical category of adjectives. Here it is relevant to contrast *pus-* 'half' with *vis-* 'SUPERLATIVE'. First of all, we need to ask ourselves what kind of bases *pus-* '*half-*' takes, and we immediately see that it is sensitive to one semantic property of the scale of the adjective, namely that it has a maximal endpoint in the set of values that it denotes (Kennedy & McNally 2005). In English, only adjectives that allow modification with the adverb *completely* / *totally*, that identifies the upper value of the scale, can combine with this prefix.

(16)   a. completely dead / totally dead
       b. half dead

(17) a. completely opened / totally opened
      b. half opened
(18) a. *completely tall / *totally tall
      b. *half tall

This is intuitive. What *pus-* *'half-'* expresses is that the property expressed by the adjective is satisfied to some extent, but not to the maximal degree that is used as the standard value to evaluate the predicate (Kennedy & McNally 2005); it lies, specifically, between the maximal and the minimal degree defined by the scale. Consequently, we do expect that only adjectives whose scale contains both a maximal and a minimal degree can combine with this morpheme.

      The morpheme is, therefore, sensitive to a property of the semantic denotation of the scale of the adjective. We start from the four classes of scales that Kennedy & McNally identify, which divide the lexical family of adjectives into groups according to the type of property they denote. It is easy to see parallels with lexical aspect or Aktionsart in this classification: in the same way that verbs can be classified through their lexical meaning according to whether they have a culmination point or not, adjectives can be classified according to the type of property they denote depending on whether that property contains a maximal value or not.

(19) Scales with a maximal and a minimal degree
      a. They allow *slightly* (*slightly sick*)
      mazliet slims
      b. They allow *completely* (*completely sick*)
      pilnīgi slims
      c. Thus, they allow *half-* (*half sick*)
      pus-slims
(20) Scales with a minimal, but not a maximal,
      degree a. They allow *slightly* (*slightly dirty*)
      mazliet netīrs
      b. They do not allow *completely* in the relevant reading (#*completely dirty*)
      #pilnīgi netīrs
      c. Thus, they do not allow *half-* in the relevant reading (#*half-dirty*)
      #pusnetīrs
(21) Scales with a maximal, but not minimal degree
      a. They do not allow *slightly* in the relevant reading (#*slightly straight*)
      #mazliet taisns
      b. They allow *completely* (*completely straight*)
      pilnīgi taisns
      c. Thus, they do not allow *half-* in the relevant reading (#*half straight*)
      #pustaisns
(22) Scales without a maximal or a minimal degree
      a. They reject *slightly* in the relevant reading (#*slightly tall*)
      #mazliet garš
      b. They reject completely in the relevant reading (#*completely tall*)
      #pilnīgi garš
      c. Thus, they do not allow *half-* in the relevant reading (#*half tall*)
      #pusgarš

In contrast, the four adjective classes do allow for superlatives, showing that the type of property that the adjective lexically expresses, and whether it allows for a maximal value or not, is entirely irrelevant for them, as illustrated below.

(23) a. sickest   visslimākais
      b. dirtiest   *visnetīrākais*
      c. cleanest   *vistīrākais*
      d. tallest   *visgarākais*

Superlative morphology is insensitive to the type of scale that the adjective denotes; what it is sensitive to is whether the adjective allows degree modifiers or not. What we believe this tells us is that, despite surface appearances, the type of element that *pus-* and *vis-* combine with is very different. In the case of *pus-*, we need it to combine with a constituent that defines the type of scale of the adjective. The type of scale correlates with whether the property that the adjective denotes is conceived as involving a maximal value or not, so this means that the morpheme attaches to the lexical category A.

(24)   [pus [A]]

The superlative *vis-* is not sensitive to these distinctions, and instead reacts to whether the adjective allows degree modifiers or not. Moreover, it is an inflectional form of the adjective, as a general class; specifically, it gives a value of degree. This is explained if *vis-* attaches not to the lexical category A, but to the functional expansion corresponding to degree.

(25)   [vis [Deg[A]]]

Consequently, the contrast between *vis-* and *pus-*, rather than falsifying our generalisation, confirms it.

2.2.3. The prefix *pa-*
The situation is a bit more complex with the prefix *pa-*, in a sense that directly confirms our generalisation, repeated here for convenience.

(26)   Latvian prefixes do not attract stress if they attach to a functional category.

Most words starting in *pa-* have stress on the first syllable. This is the case of examples such as those in (28).

(27)   a. ˈpaties+īb-a 'truth' b.
        ˈpaties+īg-s 'truthful'

What is relevant for us here is that stress falls on the prefix in the examples in (28), which include, respectively, the suffixes *-īb-* and *-īg-*. The first suffix is used to build lexical nouns:

(28)   a. darb-īb-a
           act-NOM-K
        'activity'
        b. jaun-īb-a
           young-NOM-K
        'youth'

The second one produces adjectives.

(29) a. darb-īg-s
         act-ADJ-K
      'laborious'
      b. smaid-īg-s
         smile-ADJ-K
      'smiling'

That is, in both cases the structure of the word involves a clearly lexical projection used to turn bases into nouns or adjectives.

However, the prefix *pa-* also produces some exceptions. Consider the following contrast, where on the surface both examples involve frequency adverbs whose morphological make-up minimally involves the root, the prefix and a case marker. However, stress is attracted to the prefix in only one of the two cases, the second one.

(30) a. paˈretam   'now and then, occasionally'
      b. ˈpareti   'rarely, seldom'

Interestingly, the endings also differ. In the first case, we have an ending reminiscent of the dative feminine plural marker *-ām*. Crucially, dative is precisely the case that the prepositional equivalent to the prefix *pa-*, *pa* 'on, at', would impose on the noun phrase it combines with. In the second case, in which stress is regularly assigned to the prefix, we have an ending reminiscent of nominative masculine plural *- i*, which is a case that the preposition would never assign; instead, it seems more logical to treat this morpheme as a suffix that forms adverbs productively.

This strongly suggests that (30a) should actually be treated as a real prepositional phrase that, perhaps due to frequency, has become fossilised. In such a case, we would expect enough functional structure below the prefix to accommodate the case inflection, as represented in (31).

(31)   [pa- [X –am [ret-]]]

Given that *pa-* never governs nominative, the locus of *-i* in (31b) cannot be the same X position as in (32). In fact, for purely descriptive reasons one would have to guarantee that *pa-* is not selecting the case layer in this construction, because if that was the case, nominative would not be available. This suggests that, in accordance with our proposal for the previous cases, here the prefix is below the case marking projection, and this directly attaches to a lexical head.[5]

(32)   [X –i [pa- [ret-]]]

2.3. Interim summary
In this overview, we have shown that it is possible to reduce the exceptions to regular stress assignment involving prefixes to the following generalisation:

(33)   Latvian prefixes do not attract stress if they attach to a functional category.

The purest example of this generalisation is the negative prefix *ne-*. We have shown that *pus-* acts in the same way, as with adjectives it must attach directly to A, where the scale properties to which the prefix is sensitive are defined. Similarly, *pa-* attracts stress when attached to nouns and adjectives, something immediately obvious by the morphological marking of the base. In contrast, the prefixes fail to attract stress when they attach to a degree phrase (*vis-*) or are associated to a grammaticalised form where the meaning of the root is not taken in its literal sense, but recycled to mark some notion that is only vaguely associated to it (*pa-*).

A relevant question at this point is why this generalisation has not been noted before. We believe that the cause for this lies in the existence of other counterexamples to it, involving compounds. In this article, we will not discuss stress assignment in Latvian compounds in great detail, but at this point it is relevant to mention one of the exceptions to illustrate why they complicate the picture, but belong to a different domain. The most frequently encountered counterexample to the generalisation is the one in (34), where the first member of the compound exceptionally does not attract stress. If the first member was to be analysed as a prefix, it would attach to a category that is clearly lexical, which would constitute a counterexample to the generalisation just presented.

(34)   a. labˈrīt 'good morning!'
        b. labˈdìen   'good day!'
        c. labˈvakar   'good evening!'

However, it can be shown that these cases are only apparent counterexamples to the rule that assigns stress to the first member of a compound: in fact the cases in (37) are phrases, not compounds or prefixed words. The stress assignment here is the expected one if the examples above are interpreted as phrases where an adjective and a noun are combined. In that case, it would receive the usual phrasal stress.
Note that the two members can agree (35a), and the noun can be elided (35b), which supports our treatment of (34) as phrases.

(35)   a. Lai tev lab-a dien-a!
            have you nice-K day-K
         'Have a nice day!'
        b. Cita diena laba, cita ø slikta.
            some day good some ø bad
         'Some days are good, some are bad'

Although we do not want to analyse exceptional compound stress assignment here, from the perspective of this article, (35a) clearly shows that the first member is not a prefix, as it shows agreement with the noun, and therefore these cases do not contradict our generalisation.

3. Analysis: syntax and phonology
Now that we have presented the data, we will move to the analysis. Adopting a neoconstructionist model of morphology, we will argue that these apparent exceptions are predicted once the structural height at which the prefix is introduced in the representation is taken into account: specifically, prefixes that do not attract stress are introduced above a functional head, while those that attract it are in the structural domain of the first functional head. But first, let us look at the big picture and discuss why these facts are relevant for linguistic theory beyond their internal interest for a proper account of Latvian grammar.

Beyond the language-specific goal of this paper, there are three theoretical issues for which our proposal has consequences. The first one is whether prosodic structure is predictable from the structural configuration of the prosodified constituent or not. It is well-known that there are two main approaches to this question. Nespor & Vogel (1986) argue that prosodic structure is autonomous from the syntactic configuration, noting a number of cases where they argue that the prosodification of a sequence is at odds with the organisation of its morphosyntactic constituents (see also Cheng & Downing 2016 for a similar conclusion). In contrast, other approaches have argued that prosodic structure is read from syntactic constituents in a direct way, with the consequence that what constitutes a cycle in syntax also corresponds to a cycle in phonology (see for instance Uriagereka 1999, D'Alessandro & Scheer 2015). Our proposal has consequences for this issue to the extent that, by proposing that prefixes that do not attract stress occupy a syntactic position that stress-attracting prefixes don't, we propose some isomorphism between syntax and phonology.

A second theoretical issue is whether phonology can directly refer to concepts and units of the morphosyntactic component. While many phonological approaches introduce morphosyntactic distinctions in the description of their rules and constraints (see, for instance, the distinction between lexical and functional head in Selkirk 1995 and Ito & Mester 2009), other researchers have noted that allowing phonology to directly refer to morphosyntactic units is a violation of modularity (Bermúdez Otero 2012, Šurkalović 2016) and should be avoided whenever possible. This problem is more acute when one adopts a view where prosodic structure is isomorphic to morphosyntactic constituency. Is it necessary to allow phonology to be sensitive to a distinction between functional and lexical head, or is there any indirect way in which phonology can use the distinction without directly marking a constraint as 'only applies to lexical objects'?

As we will see in our analysis, the way in which we answer these questions is the following: to the first problem we answer that at least for the case under study, stress assignment can be directly read from the morphosyntactic structure of the sequence. (This doesn't mean, however, that it cannot be reorganized phonologically in response to prosodic constraints.) To the second issue, we answer that this sensitivity to morphosyntactic structure does not need to be codified directly in the phonological component: phonology is indirectly sensitive to the height at which a morpheme is introduced because the structural height determines whether the morpheme is included inside a domain of prosodification or not, i.e., at an earlier or later level of phonological computation, and this distinction is enough to account for the facts, which makes it unnecessary to have stress rules that directly refer to a distinction between lexical and functional heads.

We divide our analysis in two parts: §3.1 discusses the morphosyntactic representation of these prefixes, within a neoconstructionist approach to word formation, while §3.2 discusses the strictly phonological operations that apply to the structures thus created.
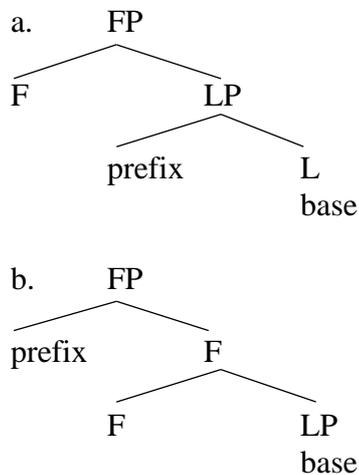
3.1. The syntactic position of prefixes in Latvian

Leaving technical details aside for a while, let us summarise our syntactic proposal. The idea is that whenever stress does not fall on the first syllable in the data discussed, it is because that syllable corresponds to a prefix that combines with a functional, rather than lexical, base. The proposal is that the domain for stress assignment in Latvian reduces to lexical layers, so prefixes attached to functional elements are outside the domain in which they could receive lexical stress.

Moving now to the technical details, syntax builds a domain for phonology and semantics using the first functional head of the structure as the boundary that delimits that domain. Specifically, and illustrating the idea with structures that are immediately relevant

for this article, the two structures in (37) contrast with respect to whether the prefix falls within the same domain as the base or not. In (37), F stands for 'functional layer' and L, for 'lexical layer'.

Figure 1

```
      a.       FP
           ╱        ╲
        F            LP
                  ╱      ╲
              prefix       L
                          base


      b.       FP
           ╱        ╲
      prefix          F
                   ╱      ╲
                F            LP
                            base
```

Note that in (figure 1a), the prefix attaches within a lexical projection (L), while in (figure 1b) it is within a functional one (FP). The idea is that the domain is delimited by the first functional head, F in both cases. In (figure 1a), the prefix is contained in the relevant domain together with the base, as shown in (36).

(36)   (F   Prefix   L)

In (figure 1b), the prefix is past the boundary marked by the head F, as shown in (37).

(37)   Prefix (F   L)

This is what crucially differentiates, syntactically, the cases where the prefix attracts or does not attract stress.
Let us concentrate now, step by step, on the distinction between *pus-* and *vis-* to show how the theory works. We start with a standard extended projection for adjectives (see Corver 1997, Kennedy 1999, Bobaljik 2012). In (figure 2), Sprl stands for 'superlative', Compr means 'comparative' and A stands for 'lexical adjective'.

Figure 2

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              SprlP
          ╱          ╲
      Sprl            ComprP
                   ╱        ╲
               Compr          AP
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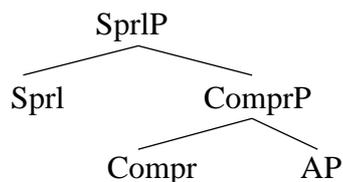
There are several arguments that support this structure, where comparative and superlative are two different functional projections above the lexical projection AP. Bobaljik (2012) presents a generalisation that shows that, cross-linguistically, both projections have to be present in that order: no language exists where the comparative is an irregular form without the superlative also being irregular (his *ABA principle). However, here we will show an

argument that the structure is appropriate for Latvian. (38) shows, respectively, the positive degree form, the comparative and the superlative of the adjective for 'beautiful'.

(38) a.   skaist(s)   positive
      b.   skaist-āk(ais)   comparative
      c. vis-skaist-āk(ais)   superlative

What we see here is that the superlative contains the morpheme that is used to mark the comparative (underlined in both forms): this is an argument for both that the two heads must co-occur in the superlative, and that the superlative is higher than the comparative. In fact, the morpheme order is straightforwardly explained if the lexical adjective head-moves to Compr, attaching to the left of the comparative affix, while the superlative prefix stays higher, and therefore linearises to the left.

Figure 3

```
              SprlP
           /        \
        Sprl        ComprP
        vis-       /      \
            A+Compr        AP
            skaist-āk     /   \
                    A        ...
                  skaist-
```
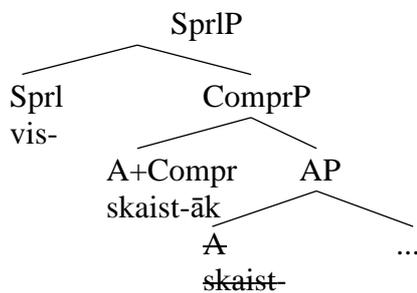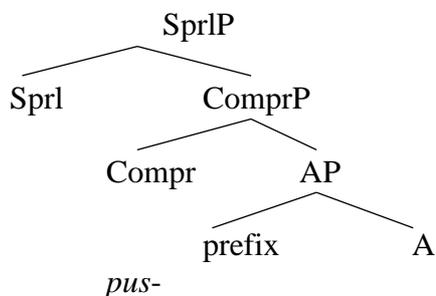
We take this to be strong evidence for the hierarchical structure taken from Bobaljik (2012). As can be seen in (figure 3), the prefix is outside the first functional head, which is defined by Compr:

(39)   vis- (skaist-āk)

Contrast this with *pus-*. This morpheme does not define a particular degree form of the adjective, and as we saw it is sensitive to the properties of the scale of the adjective, which depends on the semantics of the notion it lexically expresses. For this reason, it has to attach at a level where the degree morphology has not been introduced, but the scale properties are still accessible:

Figure 4

```
              SprlP
           /        \
        Sprl        ComprP
                   /      \
              Compr        AP
                          /   \
                      prefix     A
              pus-
```
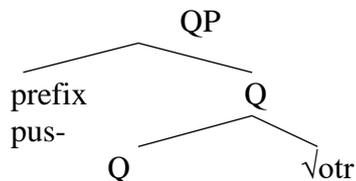
From this position, it will be able to access the scalar information of A, and, as shown by the data, degree will be irrelevant for it. Once the prefix is merged in that position, it will be contained in the same domain as the base, because the first functional head (Compr) is above it:

(40)   -āk- (pus- A)

Consider now what happens when *pus-* does not attract stress, namely in combination with a numeral. As we saw, numerals belong to the class of quantifiers, and quantifiers are functional heads. When attaching to the numeral, we see again that the prefix is outside the domain where the base is included. The Q in (figure 5) stands for 'quantifier', and the root symbol involves the basic element that produces the form in combination with the quantifier.

Figure 5

```
                    QP
              _____|_____
             /             \
         prefix             Q
         pus-         _____|_____
                     /             \
                    Q             √otr
```

(41)   pus-(otr)

Consider now negation. As *pus-*, attachment can be done to a lexical or a functional category, with distinct results. Let us start with the interrogative. There is no question that an interrogative element acts as a functional item: it codifies grammatical information that determines the type of clause, it belongs to a closed set of items and it triggers grammatical operations in the syntactic context. From here there are two conceivable options. The first one is that the interrogative is not decomposed and is just a functional head; the second one is that the interrogative item is headed by a functional item (that codifies the wh-feature) but contains inside it a lexical layer that determines whether the interrogative ranges over individuals, places, time periods, etc. This is orthogonal to our proposal, because in both cases the highest layer will be functional and the negative prefix will be attached above it, but for explicitness we will treat interrogatives as involving two layers. Given the morphological evidence in Latvian, we could decompose the interrogatives in two layers (cf. DiSciullo 2005), where the first element *k-* expresses the wh-layer that conveys the interrogative meaning and the rest can be seen as the restrictor of the wh-operator, determining whether it links temporal variables, individual variables, etc. However, as an anonymous reviewer very rightly notes, this would leave us with morpheme fragments (*-as, -ur*) that, unlike the classical definition of morpheme, do not re-occur in other contexts. Therefore, the reader should note that the decomposition made inside DiSciullo's framework is at odds with the classical structuralist definition of morpheme.

Figure 6

```
    a.      ComprP
        _____|_____
       /             \
    Compr            AP
              _____|_____
             /             \
           neg              A
           ne-        _____|_____
                     /             \
                    A             √patīkam
```

    b.   compr (ne+patīkam)

Figure 7

    a.   NegP

```
        Neg          WhP
        ne-
                Wh          NP
                k-          -as
```
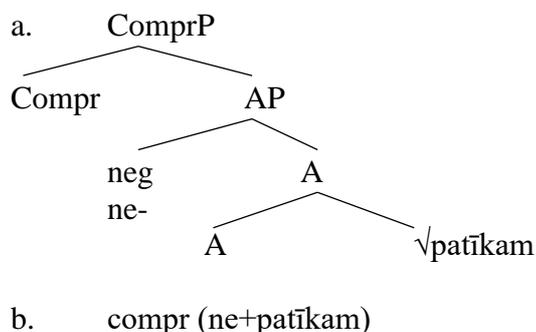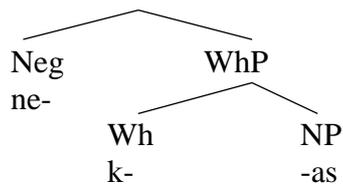
      b.   ne (k+as)

Thus, the results are predicted if syntax treats the first functional head as the boundary to define a domain for phonology and semantics.

How plausible is this principle? In fact, this general proposal has been put forward already by several authors, for a variety of languages. A number of arguments have been provided by these authors in favour of this principle (with non-trivially technically different solutions, cf. Arad 2003, 2005; Marvin 2002, Borer 2013). Borer (2013) notes that deverbal nominalisations always have a compositional meaning if they denote complex events (Grimshaw 1990). In other words: if the nominalisation does not denote the result of an event, but the event itself, that event must be the same as the one that the verbal base expresses. In contrast, non-compositional, idiomatic meanings can emerge if the nominalisation does not denote an event.

Borer's proposal is simple: the complex event nominalisation is characterised by two grammatical properties: it introduces an internal argument and it allows aspectual modifiers. Her proposal is that both properties are licensed, structurally, by a functional projection that licenses the internal argument and defines aspect. How does this account for the obligatoriness of the compositional reading? Borer's proposal is that the first functional head (F) defines the boundary of the domain where idiosyncratic meaning can be assigned by the semantic component. V+F are assigned a meaning, which is the same as that of the verb acting as the base; by the time the nominaliser is introduced, as it is outside the domain, the meaning of the verb has already been assigned.

Contrast this with the result nominalisation, which does not need to introduce an internal argument and rejects aspectual modifiers. In this case, F is missing. Here, no functional projection intervenes between V and N; therefore, the base and the nominaliser will be in the same domain for assignment of meaning, with the immediate result that it is possible that the whole develops an idiosyncratic meaning that the verb alone lacks. Consequently, also for semantics, the first functional head is the boundary that defines the relevant domain of operations. The generalisation is that the first functional head identified in the structure defines the relevant domain. We follow here Borer (2013) as she is the author that makes most explicit the connection between functional heads and the definition of morphosyntactic domains.
Consequently, here we have argued that:

    a) a domain is defined in syntax taking as the left boundary the first functional head found within a tree
    b) therefore, a prefix above a functional head will not be within the same domain as the base
    c) otherwise, the prefix will be in the same domain as the base

4.2. The assignment of stress to prefixed forms

In this section, we present how phonology assigns stress to the domains defined in the morphosyntactic component. The general idea that we will develop here is the following: the first functional head in a domain defines a first domain for stress assignment, which is associated to a phonological stratum where stress is aligned to the left. If the prefix is included in that domain – because it is syntactically attached below the first functional head – it does attract stress, and the result is an unexceptional Latvian word with stress on the first
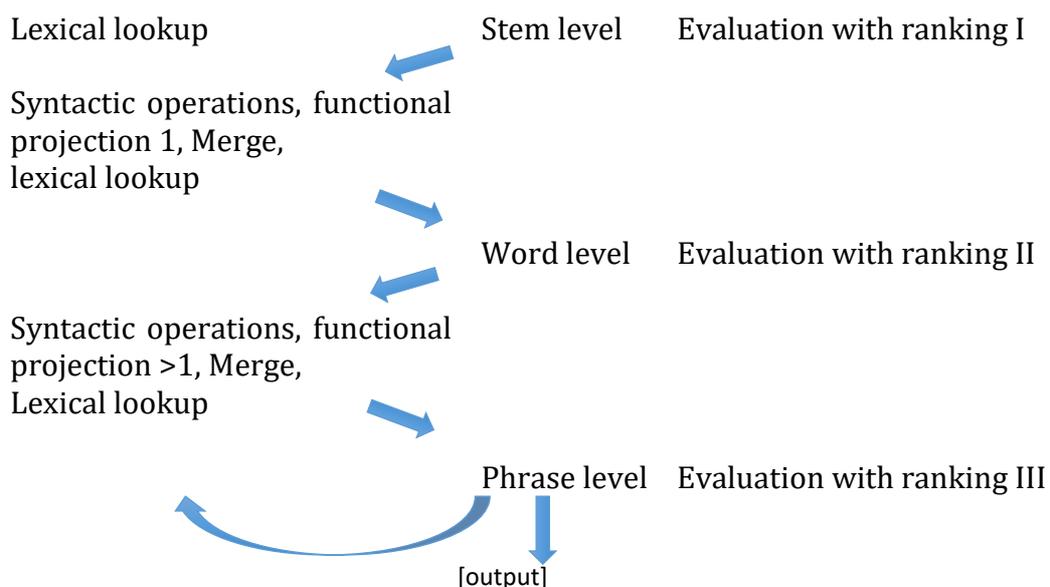
syllable. In contrast, when the prefix is attached above the first functional head, it is not included in the phonological material that is prosodified in this first stratum, and is dealt with in a subsequent stratum. In these later strata, Latvian phonology aligns stress to the right – as is the regular case with phrases in the language –, so the prefix does not attract stress. This difference – whether the prefix is included in the first stratum or not – makes it unnecessary to have phonological constraints that make direct reference to the morphosyntactic category of the unit. All phonology needs to know is whether the prefix is included in the first cycle or not, that is, if it is added early or late in the syntactic structure, which corresponds to a low position in the trees shown in the preceding subsection, and higher up, respectively.

The insight that in prefixed words with regular initial stress the prefix is dominated by a lexical projection while in irregular prefixed forms the initial element is dominated by a functional category, which in turn dominates the lexical category to which the prefix is attached can be analysed on the basis of Selkirk's (1995) insight that phonological constraints refer to lexical categories only (see as well Truckenbrodt 2006, 2007, Samek-Lodovici 2005 inter alia). However, here we prefer an analysis that maintains strict modularity and obviates the need to mix phonological and syntactic information (see Šurkalović 2016 for a recent discussion). Stratal Optimality Theory (Kiparsky 2000, Bermúdez-Otero, in prep.) divides phonological computation into strata and at every stratum a different ranking of phonological constraints is possible.[6] This is compatible with a syntactic theory that allows lexical look-up at certain points in the derivation. At these points, phonological material is retrieved from the lexicon and phonological computation can take place.

In Stratal Optimality Theory, three levels are distinguished, the stem level, the word level and the phrase level. Between each level, morphosyntactic computation and lexical lookup take place and representations subject to phonological evaluation are successively enriched by more lexical material. This is illustrated in the diagram below.

Figure 8

Interleaving phonology and morphosyntax in a stratal model of OT

Lexical lookup	Stem level	Evaluation with ranking I
Syntactic operations, functional projection 1, Merge, lexical lookup		
	Word level	Evaluation with ranking II
Syntactic operations, functional projection >1, Merge, Lexical lookup		
	Phrase level	Evaluation with ranking III

[output]

We assume that the crucial levels to explain irregular non-initial stress are the word level and the phrase level. Thus, when we mention "level one" or "the first level" in the following we refer to the word rather than stem level.

Before we develop the formal analysis, it is instructive to look at the different levels of stress in Latvian once more. We observed in section 2 that word and compound stress are left edge oriented and phrasal stress is right edge oriented. Left edge alignment of compound stress is illustrated in the examples in (42a), while right edge orientation of phrasal stress is shown in (42b), in which the highest degree of prominence is indicated by a word stress mark, bold-face and underlining.

(42) Higher level prominence in Latvian
    a. Compound stress
    ˈdzelzceḷa ˌstacija   'train + station' = 'train station'
    ˈlielˌveikals   'greater + store' = 'shopping centre'
    b. Phrasal stress
    ˈ**An**na ˈlasa ˈgrāmatu ˈ**dār**zā. 'Anna read a book in the garden.'

The compounds in (42a) can be assumed to be recursive prosodic words, as indicated in (43a) (see Ito & Mester 2009 for a formal account of recursion at the prosodic word level). The sentence in (43b) contains two phonological phrases, one consisting only of 'Anna', the other of the rest of the sentence, corresponding to the syntactic structure. While *Anna* is more prominent than the verb and the direct object, the most prominent unit is the final word in the whole sentence, *dārzā* 'garden'. We conclude that Phonological Phrases have right edge-oriented stress and so do recursive phrases/Intonational Phrases.

(43) Higher level domains in Latvian *a.*
    Left edge oriented word stress
    ((ˈdzelzceḷa) (ˌstacija))   'train + station' = 'train station'
    ((ˈliel)(ˌveikals))   'greater + store' = 'shopping center'
    b. Right edge oriented phrasal stress
    ((ˈ**An**na) (ˈlasa ˈgrāmatu ˈ**dār**zā)). 'Anna read a book in the garden.'

At the word level, thus the constraint that places stress as far to the left as possible, i.e., EDGEMOST-LEFT (see (44); McCarthy & Prince 1993; or ALIGN(PWd, L, Head, L))[7] dominates any other constraint that could jeopardize initial stress placement, such as its direct adversary EDGEMOST-RIGHT (45), constraints on quantity sensitivity (e.g., STRESS-TO-WEIGHT, Prince 1983) or Faithfulness to stress in the input, i.e., MAX(stress) and DEP(stress) (47, 48).

Since the crucial forms are assembled at different stages we follow Šurkalović (2016) here in assuming that the alignment constraints just refer to the domain under consideration rather than specific categories of the Prosodic Hierarchy (Selkirk 1980, 1981, Nespor & Vogel 1982, 1986).

(44)   EDGEMOST-L: 'Assign one violation mark for every syllable intervening between the left edge of the string and the syllable with main stress.'

(45)   EDGEMOST-R: 'Assign one violation mark for every intervening syllable between the right edge of the string and the syllable with main stress.'

A closer look at the formulation of our EDGEMOST constraints reveals that they don't necessarily favour candidates with a stressed syllable at all. They are violated by each syllable between the designated edge and the stressed syllable in the domain. A candidate that gratuitously avoids violation of both constraints is one without stress. We thus assume that the grammar contains a constraint which is highly ranked at both levels that demands the presence of a stressed unit, such as HEADEDNESS (see Ito & Mester 2014 for cases in which this constraint is violated):

(46) HEADEDNESS: 'Assign one violation mark for every domain without a unique head.'

Word and phrase stress in Latvian are fully predictable affairs, as we claim in this paper in the face of apparent counterexamples. We thus have to test our grammar against potential inputs that contain a stressed syllable already. Accordingly, we have to contemplate faithfulness to stress and its position in the ranking.

(47)   MAX(stress): 'Assign one violation mark for every stressed syllable in the input that is not stressed in the output.'

In this paper we do not want to enter the discussion why in languages with word level stress only units receive phrasal stress that already received stress at an earlier level (e.g., Halle & Vergnaud 1987). This is enforced in our analysis by the constraint DEP(stress).

(48)   DEP(stress): 'Assign one violation mark for every stressed syllable in the output that is not stressed in the input.

At the word level, or, here, rather the level of lexical projections, EDGEMOST -L dominates both EDGEMOST-R and the two faithfulness constraints MAX and DEP. This is illustrated in the following tableau[8], which uses a loanword to provide a scenario with lexical stress (from the donor language) being overruled by the fully automatic stress assignment algorithm.

Tableau 1: Stress assignment at the word level

	/universiˈtāte/	HEADEDNESS	EDGEMOST-L	MAX/DEP(stress)	EDGEMOST-R
a.	universitāte	*!		*	
b.	universiˈtāte		*!***		*
c.	universitāˈte		*!****	*	
☞ d.	ˈuniversitāte			*	*****

Compounds have to be assumed to cycle through the word level twice, once to assign stress in each member of the compound and a second time to assign more stress to the initial member of the compound.

Tableau 2: Stress assignment at the word level; compounds

	ˈdzelzceļa ˈstacija	EDGEMOST-L	MAX/DEP(stress)	EDGEMOST-R
☞ a.	ˈdzelzceļa ˌstacija			****
b.	ˌdzelzceļa ˈstacija	*!**		

The prefixed forms with regular initial stress contain the prefix already as part of the input to the word level.

Tableau 3: Stress assignment with word level prefixes (ˈne.zi.nāt 'not to know, ignore')

	/ne+zināt/	HEADEDNESS	EDGEMOST-L	MAX/DEP(stress)	EDGEMOST-R
a.	ne.zi.nāt	*!			
b.	ne.zi.ˈnāt		*!*	*	
c.	ne.ˈzi.nāt		*!	*	
☞ d.	ˈne.zi.nāt			*	**

Since phrasal stress assignment builds on the structures created at the first level, we assume that the ranking between EDGEMOST-R and the two faithfulness constraints is kept constant across levels, or, more precisely, while it doesn't matter at the word level it is crucial at the phrase level that the faithfulness constraints dominate EDGEMOST-R to avoid stress shift. The only difference in ranking between the two levels is that EDGEMOST-L is top-ranked at the first level and ranked at the bottom at the second, the phrasal level. Thus, when the output of the first level is used as the input to the second, nothing changes because of high ranking faithfulness.

Tableau 4: Stress assignment with word level prefixes, second level evaluation

	/ˈnezināt/	HEADEDNESS	MAX/DEP(stress)	EDGEMOST-R	EDGEMOST-L
a.	ne.zi.nāt	*!	*!		
b.	ne.zi.ˈnāt		*!		*!*
c.	ne.ˈzi.nāt		*!	*	*
☞ d.	ˈne.zi.nāt			**	

However, since HEADEDNESS requires a unique head at every level, the rightmost stress in a bigger unit composed of several outputs from level one, receives more stress than the other stresses.

Tableau 5: Stress assignment at the phrase level ('Anna reads.')

	/ˈAnna ˈlasa/	HEADEDNESS	MAX/DEP(stress)	EDGEMOST-R	EDGEMOST-L
a.	Anna lasa	*!	**	***	
b.	ˈAnna ˈlasa	*!		*	**
c.	ˈAnna ˌlasa			**!*	
☞ d.	ˌAnna ˈlasa			*	**
e.	ˈAnna lasa		*!	***	
f.	Anna ˈlasa		*!	*	**

For forms composed entirely of functional elements such as *ne.ˈkas* 'nothing', or the adjectival forms discussed in section 3.1, such as *vis.ˈkars.tā.kais* 'hottest', we assume that the element on the right receives stress at the first level since it already has a functional projection and when the negation is added phrase level phonology applies. The ranking between the faithfulness block and the EDGEMOST constraints at this level blocks the candidate with displacement of stress.

Tableau 6: Stress assignment at the phrase level with functional items

	/ne, ˈkas/	HEADEDNESS	MAX/DEP(stress)	EDGEMOST-R	EDGEMOST-L
a.	ne.kas	*!	*		
b.	ˈne.kas		*!	*	
☞ c.	ne.ˈkas				*

The point to be noted here is that individual affixes (such as the negative *ne-*) are not assumed to be added at a certain level, as in early versions of Lexical Phonology, but rather

that the application of word level phonology and phrase level phonology is triggered by the syntactic derivation. If *ne-* is the first functional element added to a lexical item that completes the first syntactic cycle, it will receive stress. If other functional projections precede it will remain unstressed and its prefixation result in irregular stress.

This completes the phonological part of the analysis of stress assignment.

4. Future prospects: other cases of exceptional stress assignment, and acquisition

In this article, we have concentrated on exceptional stress assignment in prefixes, which has led us to propose that a stratal account of Latvian, combined with possibly universal principles determining what kinds of heads define domains in morphosyntax, is able to account for these apparently irregular cases. However, prefixed words are not the only objects where stress is exceptionally assigned. While we do not attempt to offer a full account of other cases, the goal of this section is to outline how our general approach can be extended also to such cases.

As already mentioned, Latvian greetings are another famous exception to the general rule. However, they are not exceptional in any way either if forms such as *labdien* 'good day' (70b) are assumed to simply be phrases rather than one-word utterances/irregular compounds (recall the discussion in 2.3). Thus, each, *lab* and *dien*, separately receive word stress at the first level and then get merged at the phrase level at which the rightmost of the two receives the additional phrasal stress. Likewise, the first member of the construct might be destressed. Usually we don't witness destressing at the phrasal level in Latvian. However, in cases like this in which the result of the addition of stress would be two immediately adjacent stressed syllables, the asymmetry required by HEADEDNESS might as well be achieved by destressing the first element to avoid a stress clash. In the absence of clear phonetic evidence for one or the other, we remain agnostic about this. Addition of the constraint *CLASH ('Assign one violation mark for every pair of adjacent stressed syllables') high up in the hierarchy at level two would lead to selection of the candidate with destressing of the first syllable. Nothing has to be changed in the core of the analysis. We are aware that these greetings are formulaic, since they are contracted, lacking case endings as compared to the ordinary phrase 'good day' in (49a) or as object or subject in a sentence, such as in (49c).[9]

(49) a.   labu dienu   'good day'
      b.   Labdien!   'How's it going?'
      c.   Šodien ir laba diena mirt. 'Today is a good day to die.'

Another expression that should be treated in this extension is *paldies* 'thank you'. As an anonymous reviewer points out, this construction is more complex given the less clear etymology, perhaps related to *palīdz Dievs* 'may God help'.

Moreover, our proposal has implications for our understanding of, and makes clear predictions for, the acquisition of stress placement and the acquisition of forms with irregular stress.

A general assumption in the literature on acquisition is that children initially learn words as monolithic forms and only subsequently decompose them morphologically (e.g., Hayes 2004). The peculiarities of Latvian unstressed affixes can thus be seen as a kind of learning aid. After a child has learned the regularities of stress placement she has to deal with syntactic structure. And exceptions to their generalisations on stress provide cues to the morphosyntactic organisation of the language.

Under the assumptions that children proceed from whole word learning to morphosyntactic deconstruction and that phonological acquisition is ahead of morphosyntactic acquisition we expect children to initially produce irregular forms correctly, then overgeneralize the stress rule and produce the exceptional forms with initial stress, and in a third phase produce them

correctly again and be capable of spontaneous correct innovations. This constitutes a case of U-shaped learning (Pinker 1984, 1991). Interestingly though, while the usual u-shaped learning curve is observed with true exceptions (e.g., irregular verb forms), in our case we would not simply be looking at the transition from associative to rule-based behaviour and the subsequent correct memorisation of exceptional lexical items, but rather at a development in which the generative system is further refined after the overgeneralization stage. Further research has to show if these predictions are borne out.

5. Conclusions

The otherwise extreme regularity of stress assignment both at the word and the phrase level, even extending to loanwords, renders the few exceptions with stress on the second syllable baffling at first. A closer look at the data reveals that the "exceptional" stress is actually highly systematic and depends on the categorial status of the morpho-syntactic elements involved. The regularly stressed prefixed forms are dominated by a lexical category while the irregular ones are all derived later and headed by a functional category. Thus, an apparent problem in Latvian prosodic phonology in the end provides us a more intimate understanding of the workings of Latvian grammar and of the syntax-phonology interface in general.

Furthermore, with respect to the two theoretical issues highlighted in §1, the main conclusions of this work are the following:

a) At least for the case of exceptional stress assignment in Latvian prefixes, an account, in which prosodic structure is read from the syntactic structure directly seems sufficient. This, of course, does not mean that certain autonomy in how phonology acts is totally out of the question; the literature points out many other mismatches in languages that are not covered in this article. However, our claim is that an approach based on the notion of domain should be at least explored for these exceptional cases as well.

b) Similarly, at least for the case we have researched here, phonology does not need to refer directly to morphosyntactic categories. The reason why stress assignment is sensitive to whether a prefix attaches to a functional head or a lexical one is not that phonology is directly sensitive to this distinction, but rather that the height at which the prefix is introduced is relevant for whether it is included in the first cycle – associated to a phonological stratum where stress is to the left– or to a later cycle – associated to a stratum with stress to the right.

While there are other cases that deserve attention, and should be used, to further scrutinise our proposal, we hope to have provided a plausible account of a fragment of Latvian grammar in these pages that elucidates the interaction between morphosyntax and phonology.

Notes

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[1] Throughout, we present examples in Latvian orthography withword stress marked with the respective IPA symbol, a high stroke preceding the stressed syllable ʹ. Additional phrasal stress is indicated by bold-face and

further stress by additional underlining. Where present, dots within words indicate syllable boundaries and hyphens morpheme boundaries.

[2] As will become clear in the analysis, we assume a Neo–Constructionist model where the same set of principles and primitives builds both 'morphological words' and phrases. We distance ourselves, then, from proposals like Williams (2007), where the domain of word formation involves a distinct module from syntax. In this sense, both instances where stress is attracted by a prefix and cases where it is not, are cases where one builds complex constituents in syntax, and our contention is that the minimal difference is whether they are contained within the first cycle or not.

[3] Interestingly, as the analysis that we will propose predicts, the same unusual stress pattern emerges with other words derived from the same interrogative elements: cf. *jeb-'kurš* 'whoever', *jeb-'kad* 'whenever'. We are grateful to an anonymous reviewer for this observation.

[4] Here we take the term 'universal quantifier' to refer to a semantic object, which can be instantiated in different grammatical categories, and which translates semantically as a logical constant ($\forall$) interpreted as 'for all members of the class X defined in a context'. The class X is its logical restrictor, and the combination of quantifier and restrictor applies to another expression. Thus, inIkviens dzied 'everybody sings' the expression translates as 'for all members of the class of humans, it is the case that they sing'.

[5] A different situation is illustrated by (i), where, despite the difference in marking, both forms display exceptional stress.
 (i)
        a. pa'tiesi   'really, indeed'
        b. pa'tiešām   'really, indeed'

While the form in *-ām* is accounted for by the analysis proposed in (33), something additional has to be said about (ia), given that here the case marking cannot be behind the difference. Our proposal is that here the functional layer that is responsible for the prefix being more external relates to the meaning of this form. Coming from an archaic form meaning 'truth', the adverb in (ia) has developed a meaning as a focus emphatic marker, as in (ii).
(ii)   *jūra **patiesi** garoja   kā pirts sestdienā*
          sea   truly   smoke.pst like sauna Saturday
          'The sea was indeed smoking like a sauna on Saturday'

Here the meaning of the root is not the literal one, but has been turned into a grammatical function marker associated to focus. For thisreason, we expect that in the internal structure of the prefixed word the base contains functional layers that mark focus. The prefix would be attached above these focus layers, which would explain why in this case, but not (32b), stress is not attractedby it.

[6] In Optimality Theory (Prince & Smolensky 1993/2004) —stratal or parallelist—, universal violable constraints are ranked in a hierarchy on a language-specific basis. A Generator function proposes a set of output candidate forms for every inputsubmitted to the system. The Evaluator function compares these candidates and registers violations of constraints. The form with the least severe violations wins the competition and is selected as the output form.

[7] In more recent literature, EDGEMOST constraints are formalized as Alignment or Anchoring constraints (McCarthy Prince 1993, 1999). Alignment constraints have undergone some evolution from gradient to categorical (McCarthy 2003, Hyde 2012, Martínez-Paricio & Kager 2015). The difference is immaterial to our concerns here and our analysis works under either conception of alignment. We thus use the constraint schema we expect readers to be more familiar with.

[8] OT tableaux are organised as follows: The cell in the top left shows the input, usually given between forward slashes, indicating its lexical/phonemic nature. In this tableau, we use vertical slashes to indicate that this is not the underlying representation, but rather the output chosen at an earlier level of evaluation. To the right, we see the relevant constraints each heading a column. Uninterrupted lines between these columns indicate that the constraints to the left and right are ranked with regard to each other, i.e., the violations, represented by asterisks, incurred on a constraint to the left are more important than those on the right. If two constraints are separated by an interrupted line, they are not ranked with regard to each other and violations to either side of the dashed line count equally. Below the input is the list of output candidates. Constraint violations incurred by each candidate are given in the same line as the candidate in the column under the constraint violated. The hand symbol points at the winning candidate that is chosen as the output form. All other candidates are discarded. Exclamation marks next to asterisks mark fatal constraint violations. At this point, a candidate loses against another candidate and is excluded from comparison.

[9] Finally, Eckert et al. (1994: 279) mention cases in which stress is foundon the third syllable, such as *pama ˈzītiņām* 'gradually'. While these forms deserve further investigation, we suspect that they will be amenable to the analysis proposed here for mono-syllabic exceptional prefixes.

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Raksts iesniegts publicēšanai žurnālā *Journal of Baltic Studies*.