Element subtraction in Pomeranian and German
-
The competitive tier

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Abstact

Subtractive effects in derivational and inflectional morphology has been a long standing challenge in morphophonology (Bloomfield 1933, Hockett 1954, Bye & Svenonius 2010, Birkenes 2014). Recent accounts of "subtraction as addition" (Trommer & Zimmerman 2015, D'Alessandro & Van Oostendorp 2016) attribute subtraction to a prosodic defectiveness: a mora without syllablic parsing and without segmental content is added. The latter study extends the approach to metaphonic subtraction in Abruzzese *belle-bille*, where an element, |A|, is subtracted from the root. In this paper, we attribute metaphonic subtraction to a defectiveness *at the lowest prosodic level*, i.e. elements without grid points. Such defective (floating) elements become active upon tier alignment. Basing ourselves on new Pomeranian data, we propose a competitive vocalic tier on which elements compete for a prosodic slot, besides the well-known vocalic tier that allows for element conflation. The hypothesis predicts alternations such as the [ɑi]-[ɪ] and [e]-[ɪ] root alternation (German *treten-tritt* '(he) step(s), Pomeranian *gaita-git* '(he) pour(s)'). The model allows us to solve two conundrums in German morphology: 1. the "epenthesis conundrum", i.e. the anti-correlation between OCP-driven schwa epenthesis between root and suffix in German (*rett*[ə]*t/*rett* versus **rät*[ə]*t/rät*) and root alternations in present tense verbs (alternating verbs): *retten-er rettet, raten - (er) rät* (Neef 1997, Trommer 2007, Scheer 2016). Secondly, the model allows us to solve the "imperative conundrum" (Raffelsiefen 2016), which describes a correlation within the class of alternating verbs: the correlation between |A|-subtraction in a subset of alternating verbs (*geben-gibt* 'give(s)') and ending-less imperatives in German (*gib!* 'give!'). The model makes an observational generalization over root shortening and subtraction of melodic content, although the model is, as yet, not designed for a full implementation.

Keywords: *subtractive morphology, Element Theory, umlaut/metaphony, vocalic tier*
Languages: *High-German, Pomeranian, Abruzzese, Portuguese*

1. Introduction[*]

In their discussion of apophony, Ségéral & Scheer (1998) discuss German ablauting verbs such as *binden-band-gebunden* 'bind-bound-bound' and identify a universal apophonic sequence I-A-U. If we assume autosegmental theory with a consonantal tier (not represented here) and a vocalic tier (Goldsmith 1976, McCarthy 1979), and if we assume the melodic

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content to be captured in Element Theory (Kay et al. 1985, Backley 2011), we can represent this as in (1).[1]

(1)

	binden	*band*	*gebunden*
	b • n d-	b • n d-	b • n d-
	|	|	|
vocalic tier	|I|	|A|	|U|

There is also a more complex case of I-A-U ablaut, as in *helfen-half-geholfen* 'to help', where the ablauting I-A-U sequence is superposed on, what Scheer calls, a "parasitic element", represented under (2), where the parasitic element is |A|, realized on another tier. As it is unaffected by changes on the tier that underegoes ablaut, we assume it to be in distinct planes (multiplanar approach, Archangeli 1985). While the ablauting vowel undergoes a change, the parasitic element remains constant.

(2)

	helfen	*half*	*geholfen*
"parasitic element"	|A|	|A|	|A|
	|	|	|
	h • lfen	h • lf	h • lfen
	|	|	|
ablaut	|I|	|A|	|U|

This parasitic element in the case of *helfen* derives historically from an |A| element, which was part of a suffix and anchored to the root. In this paper we show that both levels represent *two different vocalic tiers* with distinct properties. We call these V1-tier and V2-tier, as in (3).

(3)

V2-tier	|A|	|A|	|A|
	|	|	|
	h • lfen	h • lf	h • lfen
	|	|	|
V1-tier	|I|	|A|	|U|

One property of the V2-tier is mentioned in Postma (1996, 2014) where it is argued that the parasitic element can undergo ablaut of another type, which is coined "consonantal": A-I-A or A-U-A, as in Dutch *helpen-hielp-geholpen* 'help' (4a), *delven-dolf-gedolven* 'dig' (4b).[2]

(4) a.

	[hɛɫpən]	[hiəɫp]	[ɣəhoɫpən]
V2-tier	|A|	|I|	|A|
	|	|	|
	h • lpen	h • lp	geh • lpen
	|	|	|
V1-tier	|I|	|A|	|U|

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[1] For reasons of elegance, skeletal vocalic grid points are indicated with •. This is equivalent to the V or X in the earlier templatic literature.

[2] Verbs often jump between the two classes in (4), dialectologically: e.g. *helpen-holp-geholpen* in many Dutch dialects.

(4) b.   [dɛɫvən]   [doɫf]   [ɣədoɫvən]

V2-tier |A| |U| |A|
                                            | | |
                                         d • lven   d • lv   ged • lven
                                            | | |
V1-tier |I| |A| |U|

We cannot go into "consonantal" ablaut here, but one thing should be mentioned. It is shown that this V2-layer has special OCP interactions with the (consonants in the) onset[3] and coda[4], and with the (consonants of) prefixes and suffixes. In the case of |A| on the V2-tier in (4), there is also a relation with the suffix: the |A| in (3) originates from the present tense suffix, which contained [a], e.g. OHG 13pl *-an*. This |A| has spread to the stem and was later generalized over all persons and tenses: it became part of the root. This generalized |A| features the change from *gehulfen* to modern *geholfen*. It also shows that, synchronically, the relation between /hilf-/ and /help-/ is not A-umlaut anymore, i.e. addition of |A| to /hilf/ creating /help/ (which is diachronically the case), but *subtraction* of |A| from /help/ creating /hilf/ in synchrony. If *hilf* were the base form, we would expect the ablaut sequence *hilf-half-hulf*, counter to fact.

(5)

	raten		treten	
1sg	rate	|A|	trete	|I|+|A|
2sg	rätst	|A|+|I|	trittst	|I|
3s	rät	|A|+|I|	tritt	|I|
1pl	raten	|A|	treten	|I|+|A|
2pl	ratet	|A|	tretet	|I|+|A|
3pl	raten	|A|	treten	|I|+|A|

Notice that *addition* of |I| (i-umlaut) and *subtraction* of |A| pattern in (5) as if it were one and the same morphological process. Hence, we are trying to generalize over I-addition and A-subtraction in the 23sg forms of the present tense paradigm.

2. How to subtract |A|?

In this paper we study the mechanism of A-subtraction and I-addition, which creates alternating roots in the present tense paradigm, and their relation with Scheer's 2016 conundrum: why is schwa epenthesis after dental roots, e.g. *retten - er rettet* 'to save - he saves', systematically absent in alternating present tenses, such as *er rät/*rätet* 'he guesses', and *er tritt-*trittet* 'he steps'? We solve this conundrum by using the different properties of the V1-tier and the V2-tier. For that purpose we must bring into the discussion, a second property of the V2-tier: it is mono-valued in the sense that elements <u>compete</u> for realization on the V2-tier, while elements <u>conflate</u> on the V1-tier. This may be related to the V2-tier's morphemic origin and perhaps synchronic morphemic status.

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[3] For instance: all Dutch ablauting verbs with a laryngeal onset /h/ have |A| in the stem are of the AIA-type: *hauwen/houden/helpen/hangen/heffen.*

[4] The closed root stems typically have a liquid in the stem, which is for /r/: C—|A|, and for /l/: C—|A|+|U| or C—|A|+|I|. Open roots create closed syllable in the second ablaut step, which can be of the I-type (*staa-n/stond/gestaa-n* 'stand') or the U-type (*zie-n/zag/gezie-n* 'see').

The different behavior of the two vocalic tiers is nicely illustrated by comparing German & Low Saxon with another West-Germanic language, Pomeranian, in the plural morphology by umlaut in some nouns. Consider the following sg-plural pairs, i.e. lemmas such as 'foot-feet', 'hat(s)', and 'book(s)' which is a productive class in many Continental Germanic dialects.

(6)		foot-feet	hat(s)	book(s)	
a.	/fu:s/-/fy:se/	/hu:t/-/hy:te/	/bu:x/-/by:çer/	German
b.	/fo:t/-/fø:te/	/ho:d/-/hø:(r)/	/bo:k/-/bø:ke/	Low Saxon[5]
c.	/faut/-/fuit/	/haud/-/huir/	/bauk/-/buiker/	Pomeranian

Both in High German and in Low German, the plural is formed by adding a floating |I| element to the stem (apart from segmental material). Now, the first thing that strikes in (6c), is that no complex vowels are present in this Pomeranian pair. |A| and |U| in the singular *faut* are realized as distinct segments [faᵘt], the broken form of the **Low** German /foot/. Similarly, in the plural *fuit*, |U| and |I| are also realized as distinct segments [fuⁱt], the broken form of **High** German /füüs/. The broken forms suggest that vocalic elements in Pomeranian do not conflate. Significantly, upon addition of the extra (floating) |I| of the plural ("umlaut"), the A-element of the root is not realized: it is "pushed out" upon right-to-left alignment[6] of the melody over the available grid points. |A| is "not parsed", as it is without grid point.

(7) V2 tier
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        |A| |U|  |I|         |A|  |U| |I|              Pomeranian
         |   |    |                |   |
        f • • t +═     →     f •   • t                 faut → fuit
```

We capture this effect in Pomeranian by saying that the vocalic tier is competitive rather than conflating in Pomeranian. We identify this competitive behavior as a <u>V2-tier property</u>. For German and Low-Saxon, we assume that the suffixal I-element is the V2-tier vowel as well, while the root vowels are realized as V1-tier vowels, as in (8-9).

(8) V2 tier
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                        |I|              |I|            German
                         |                |
            f • • s +═     →       f •   • s            fu:s → fy:se
                \  |                  |  /
   V1 tier      |U|                   |U|
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(9) V2 tier
```
                        |I|           |I|               Low Saxon
                         |             |
            f • • t +  ═    →    f • • t                 foot → fööte
            |  /                 |  /
   V1 tier  |U|—|A|              |U|—|A|
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The competition effect in (7) is wide-spread in Pomeranian morphology, both in inflection and derivation, for instance in denominal verbs: *blaud* 'blood' - *bluira* 'to bleed' (Postma 2016). Some roots in Pomeranian, however, do realize complex vowels, for instance *dråga-*

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hai drögt 'to carry/he carries' with a short vowel, or words like *hüüt* 'today' (~ Germ. *heute*) with long complex vowels. Consequently, also Pomeranian realizes a V1-tier. We therefore assume that the two types of V-tiers is provided by UG and the choice between the type of tiers is lexical dependent, but lexically constant. We summarize the proposal under (10).

(10)   • Natural language has two autosegmental vocalic tiers:
               V1-tier is conflating
               V2-tier is competitive
     • <u>Competitive Principle</u>
      Every grid point is linked to maximally one element on the V2-tier
     • The umlaut factor (floating I-element) in West-Germanic realizes on the V2-tier
     • Most lexical roots realize their vowels on the V1-tier, but some roots on the V2-tier
      in Pomeranian ("breaking").

These assumptions create the possibility of apparent *subtraction* of phonological elements, under influence of standard additive morphological processes. In the next section we apply this approach to the problem under scrutiny.

3. Alternating verbal paradigms

In this section, we apply the mechanism developed above to the problem of the alternating verbal paradigms, i.e. I and A umlaut in the strong verb class present tense. It creates alternation such as *ich falle-du fällst* 'I/you fall', and *ich gebe-du gibst* 'I/you give'. The analysis is rather straightforward. We assume for German that the root vowel(s) realize on V1-tier, while the synchronic suffixal I and the diachronic suffixal A realize on the V2-tier. The representations are under (11-12).

(11)   V2 tier |I| |I|
                      | |
              f • l l + ⇀ t   →   f • l l t   fall + it → fällt
                | |
     V1 tier |A| |A|

(12)   V2 tier |A| |I| |A| |I|
                | | | |
              h • l f + ⇀ t   →   h • l f t   helf + it → hilft
                | |
     V1 tier |I| |I|

Some comments are in place. Under (11) we have the more simple I-umlaut. This I-umlaut comes about by adding a floating I-element in the 23sg of the present tense by some morphological (inflectional) procedure. We assume it is on the V2-tier, i.e. it is competitive, but this property is not really active in the case of *raten* 'guess' and *fallen* 'fall'. The floating I-element does not have a grid point of its own and anchors to the (stressed) stem and stays on its own tier. The result is an alternating stem vowel [a] to [ɛ]. Let us now look at the more challenging case of *helfen* 'help', a verb with had, historically, A-umlaut. As we have seen from the introduction, these verbs have generalized an A-element that used to be part of the ending. It has become part of the root (producing *geholfen*) but this (originally suffixal) A-element has not changed its V2-tier nature. We then have the structure in (12). Now, consider what happens if we add the normal suffixal floating I-element of 23sg present tense. As it is a

V2-tier element, and since V2-tier elements compete, the anchoring of the suffixal I to the stem and upon right-to-left alignment, pushes out the A-element. As a result, we get a seemingly subtractive effect, although it comes about by a normal additive procedure with the standard floating I-suffix. The A-subtraction is a kind of stray erasure effect (Steriade 1982). This generalizes over the two paradigms in (5). Notice that on the competetive tier it is possible to add and subtract by one and the same process.

4. The imperative conundrum

The two vocalic tier approach works fine thus far. To test its strength, we apply it to a conundrum in German philology (Raffelsiefen 2016), related to the Epenthesis Conundrum (which we solve in section 6). We coin it the *Imperative Conundrum*. It is not really a conundrum when it is analyzed from a diachronic point of view, but it is a conundrum from the synchronic stake defended in this paper. It concerns the shape of the imperative in alternating verbs such as *raten* and *treten*. The stem vowel of imperative in the former class is derived from the stem vowel of the **non-23sg form**: *rate-rätst-rät* has *rat(e)!* as its imperative. In the latter class, on the other hand, the form of the imperative takes the stem vowel of the **23sg form** as its basis: *trete-trittst-tritt* has *tritt!* as its imperative.

(13)   Imperative Conundrum
       • Alternating verbs have the non-23 stem as imperative if the infinitive has /a/a:/au/ in the stem, + optional schwa: *schlaf(e), rat(e), lad(e), lauf(e),* etc.
       • Alternating verbs have the 23 stem as imperative if it has /e/e:/ in the stem, + no schwa: *gib, nimm, sieh, ficht, tritt,* etc.

From a historical point of view, (13) is perfectly understandable: the imperative takes the verbal bare root + imperative suffix, i.e. it lacks both the suffixal I-element in the *rate-rätst-rät* class, resulting in *rat!*, and it lacks the (originally) suffixal A-element in *treten*, resulting in *tritt*! So, from an historical perspective, there is no conundrum. However, as we have seen in section 1, the synchronic situation is that this A-element is part of the root for the present-day native speaker. And secondly, we have seen in section 3 that the alternating verbs do not come about by A-umlaut, but by adding a floating I-element, just as in the case of the I-umlauting verbs, which expels |A|. So, we are looking for a synchronic account.
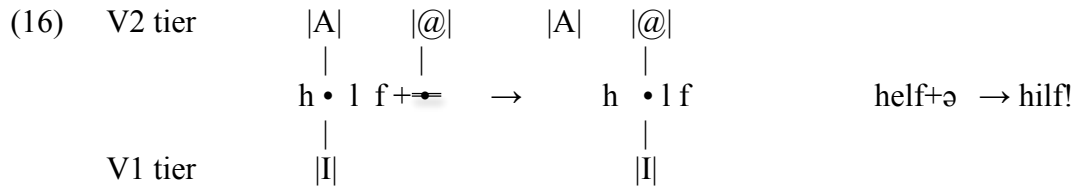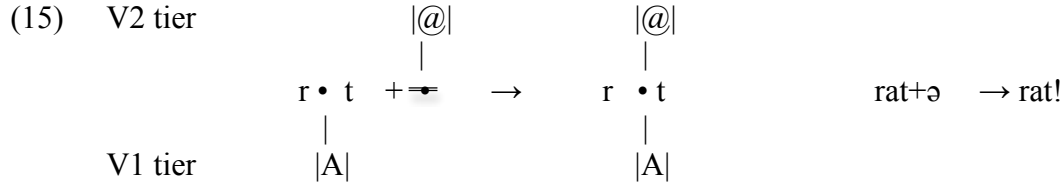
Our model developed in the previous pages provides a way to see the imperative forms as being produced by a synchronic, productive, regular process. The representations are under (14-15). In order to get the desirable results, we only have to assume an imperative morpheme that sits on the V2 tier (as it is a suffix). Since the German imperative morpheme is schwa in weak verbs (*spielen/spiele!* 'play.inf/play.imp'), let us assume it is schwa in strong verbs as well. Now, schwa is represented in element theory in various ways, but we take it here as a kind of neutral element |@| (Van Oostendorp 2005) which follows the vowel calculus proposed there, i.e. A+@=A, and I+@=I etc. We further need two additional hypotheses on the licensing of schwa.

(14)   • Schwa must be licensed. Schwa is licensed if it is stress-governed or by spreading to the stress. Suffixal roots are governors. Apophonic roots are no governors.[7]
         • A spread vowel can not expel a neighboring vowel.

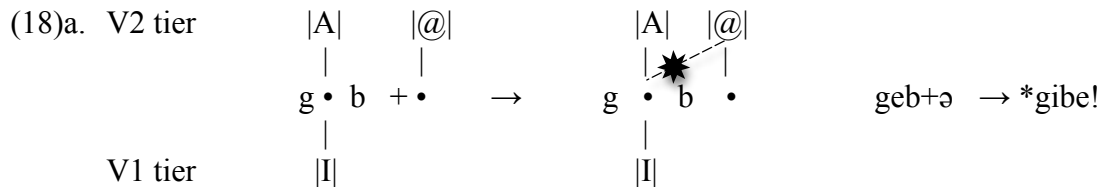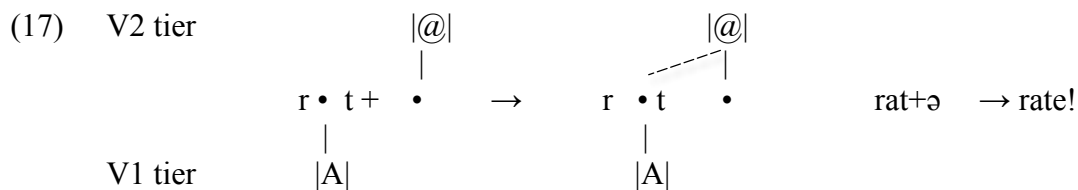The first bullet in (14) captures the fact that schwa is parasitic on another stressed syllable: it

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[7] Enguehard (2016) captures the distinction in terms of phase theory, cf. also Lowenstamm (2010).

is either stress-governed (weak verbs) or moving to it (strong verbs). The second bullet captures that a spread vowel is not "strong enough" to expulse a neighboring vowel. This follows from the very nature of alignment.[8] Let us see what happens when a floating imperatival schwa is added.

(15) V2 tier |@| |@|
                                  | |
            r • t + •   →   r • t   rat+ə   → rat!
                  | |
       V1 tier |A| |A|

(16) V2 tier |A| |@| |A| |@|
                      | | | |
            h • l f + •   →   h • l f   helf+ə → hilf!
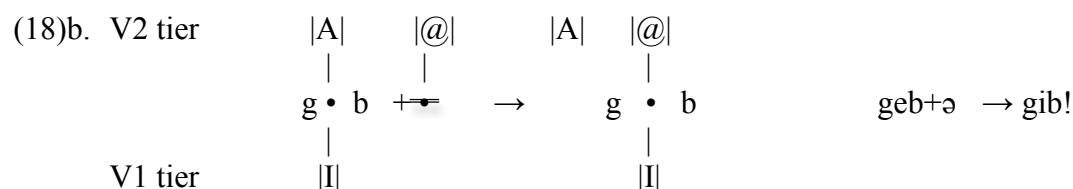 | |
       V1 tier |I| |I|

In (15)-(16) we represented the non-spreading strategy. For the a-stem verbs such as *raten* 'guess' and *schlafen* 'sleep', etc, |@| simply realizes on the V2-tier of the verbal root. No element is present on this tier and so, there is no problem in this case. The more interesting case is the A-umlauted verbs. As this |A| is synchronically part of the stem as a V2-tier vowel, it goes in direct competition with |@|. Upon right-to-left alignment, the |A| remains without anchoring, it is driven out by the imperative-schwa, as it were. *Hilf* results.

In (17)-(18) below, we analyze the variants with spreading of |@|, *rate!* and **gibe*. The spread variant, though slightly stilted in modern German, is without problem in the case of *raten*, because there is no element on the V2-tier. In the A-umlauted class, spreading is simply not invoked upon right to left alignment as it is a last resort (McCarthy 1979) because two elements are present (|A| and |@|) and two grid points. Moreover, the result would be ill-formed because one grid point is occupied with two V2-tier elements. These spread variants are indeed absent: **hilfe!*[9] 'help.imp', **gibe!* 'give.imp', **tritte!* 'step.imp'.

(17) V2 tier |@| |@|
                               | ⁻ ⁻ ⁻ |
            r • t + •   →   r • t   •   rat+ə   → rate!
                  | |
       V1 tier |A| |A|

(18)a. V2 tier |A| |@| |A| |@|
                       | | |✷ |
            g • b + •   →   g • b •   geb+ə → *gibe!
                  | |
       V1 tier |I| |I|

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(18)b. V2 tier |A| |@| |A| |@|
                  | | |
               g • b +⊷   →   g • b   geb+ə → gib!
                  | |
      V1 tier |I| |I|

This solves the imperative conundrum.

      Notice that the system allows for a combination of the strategies in (17) and (18b) with a double |A| on V1- and V2-tier, as in (19).

(19)a. V2 tier |A| |@| |A| |@|
                  | | | ✸ |
              l • ss + •   →   l • ss   •   lass+ə → *lasse!
                  | |
      V1 tier |A| |A|

b.   V2 tier |A| |@| |A| |@|
                  | | |
              l • ss + ⊷   →   l • ss   lass+ə → lass!
                  | |
      V1 tier |A| |A|
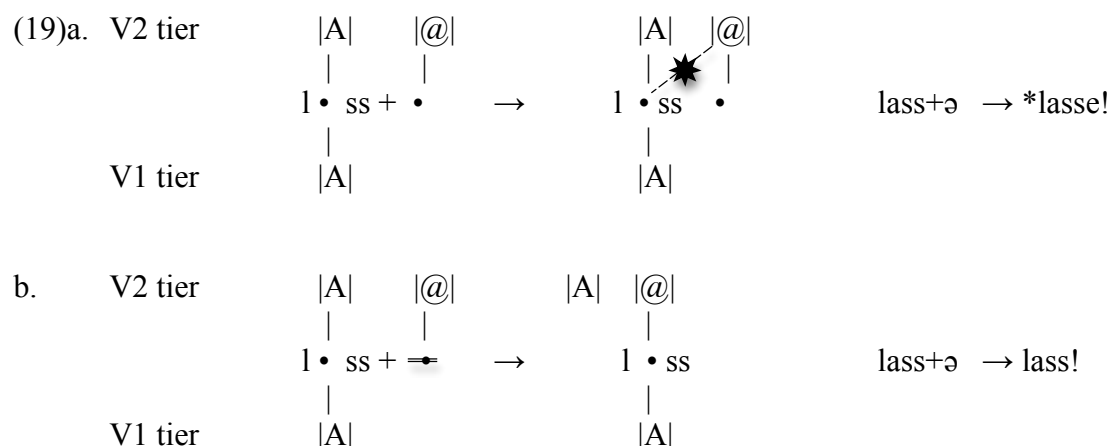
This option is realized in the verb *lassen* 'let' (and *fallen* 'fall' for some speakers), which is an alternating verb of the i-umlaut type (*lassen-lässt*) but also lacks the option of schwa in the imperative (lass!/*lasse!). It is evidence that a double |A| element is present on both V1 tier and V2 tier in *lassen* 'let'.

5. Excursion: application to alternating verbs in Pomeranian
Pomeranian (Tressmann 2006, Postma 2016) has lost the umlauting class of alternating verbs completely, just as the Low Saxon dialect (Gronings) in the Netherlands did (Reker 1989): there are no *raten-rät* verbs. The other type is in full swing: *geewa - hai giwt* 'to give- he gives', which has the same analysis as in German, where |A| has pushed out. This class has slightly extended, for instance, *gaita-git* '(he) pour(s)', *haita-hit* 'be called'. In addition to this, a new class emerged. Under (20) we give some typical cases, of the new alternating verbs, where in addition to a vowel change there is vowel shortening (also present in German). In contrast to what we saw with long vowels, these short vowels are always complex.
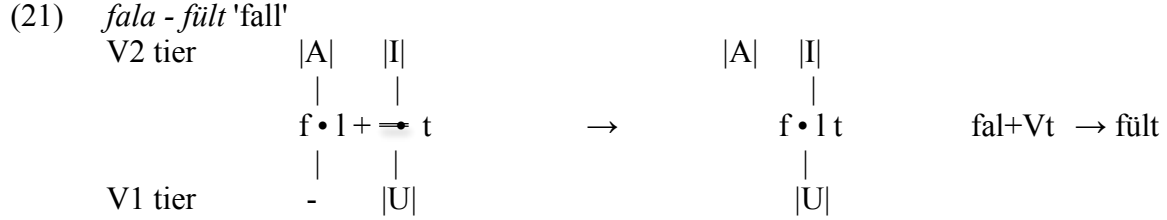
(20)   Alternating verbs in Pomeranian, taken from Tressmann (2006).
       a.   fal+Vt   → fült   'falls'
               forlair+Vt   → forlürt   'looses'
       b.   koom+Vt   → kümt   'comes'
       c.   krup+Vt   → krüpt   'creeps'
       d.   drå:g+Vt   → drögt   'carries'
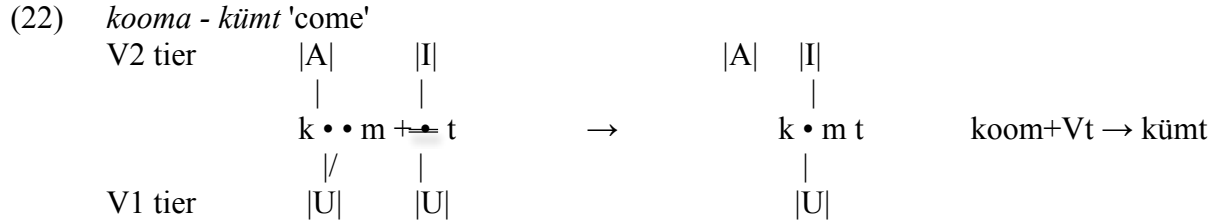   e.   stöit+ Vt   → stöt   'bumps'

As one can inspect form (20), there is addition of |I| + |U| to the root, which is sometimes competitive with the stem vowel, as in *fala* 'fall' and *kooma* 'come', and sometimes conflating, as in *dråga* 'carry' and *stöita* 'bump'. Since only one of these suffixal |U| and |I| elements can

be on the V2-tier by hypothesis, we assume that it is |I| that is on the V2-tier, just as in German. Then, |U| must be on the V1-tier. Let us start with the typical Pomeranian case, where the verbal root is on the V2 tier (cf. 7), e.g. *fala-fülst* 'fall' and *forlaira-forlürt* 'loose(s)'. *Fala* is analyzed under (21).
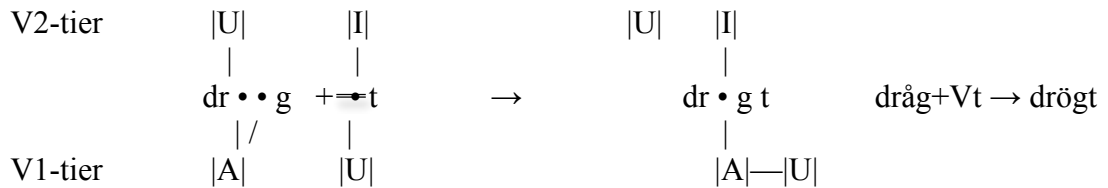
(21) *fala - fült* 'fall'

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V2 tier      |A|    |I|                  |A|    |I|
              |      |                           |
            f • l + ➤ t         →        f • l t        fal+Vt  → fült
              |      |                           |
V1 tier       -     |U|                         |U|
```

As we see, the suffixal I-element pushes out the radical |A|, which is on the V2-tier. Together with the U element on the V1 tier, the root vowel becomes [y]. A variant of this case is *kooma* 'come' which has a complex vowel. It is given under (21).
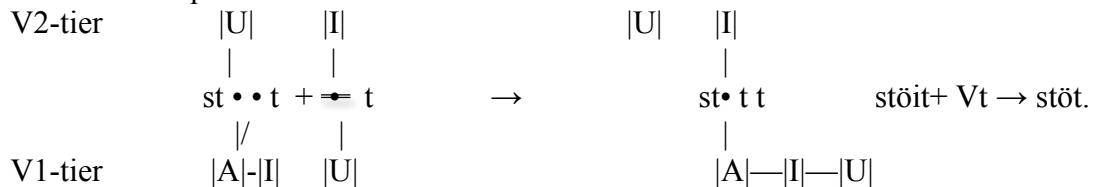
(22) *kooma - kümt* 'come'

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V2 tier      |A|      |I|                 |A|    |I|
              |        |                          |
            k • • m + ➤ t       →        k • m t        koom+Vt → kümt
             |/       |                          |
V1 tier      |U|      |U|                        |U|
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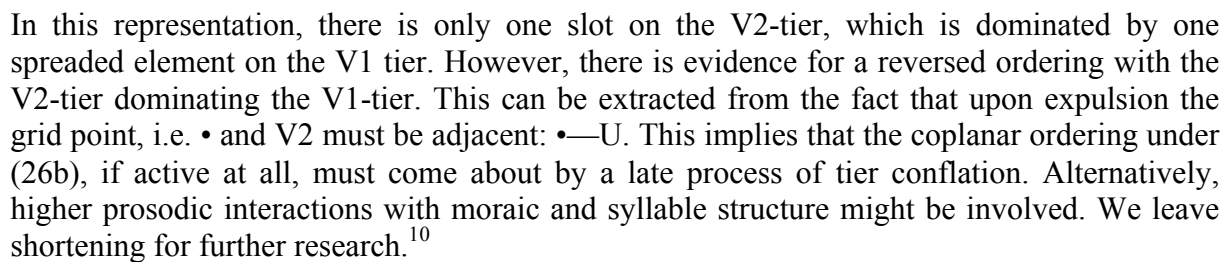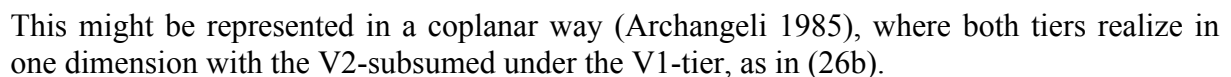The other cases under (20) are completely straightforward. We give them under (23-25) for reference only.

(23) *krupa - krüpt* 'creep'

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V2 tier        |U|    |I|                  |U|    |I|
                |      |                           |
             kr • p + ➤ t       →        kr • pt        krup+Vt → krüpt
                |      |                           |
V1 tier         -     |U|                         |U|
```

(24) *dråga - drögt* 'dry', *låta - löt* 'let', *fåta - föt* 'fetch'

```
V2-tier        |U|        |I|               |U|    |I|
                |          |                        |
             dr • • g  + ➤ t     →        dr • g t        dråg+Vt → drögt
               |  /        |                        |
V1-tier        |A|        |U|                   |A|—|U|
```

(25) *stöita - stöt* 'bump'

```
V2-tier        |U|      |I|                 |U|    |I|
                |        |                          |
             st • • t + ➤ t       →        st• t t        stöit+ Vt → stöt.
               |/        |                          |
V1-tier       |A|-|I|   |U|                   |A|—|I|—|U|
```
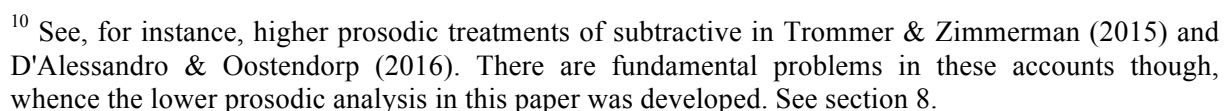
The latter two cases nicely show the *conflation* of elements on the V1-tier and the *competition* of elements on the V2-tier. There is some redundancy in the system, which we lifted in (23)

with the assumption that Pomeranian roots tend to occupy the V2-tier, as the language has a structural tendency to breaking, which is a V2-tier phenomenon, cf. (7). The stem shortening in the 23sg forms of the present tense (e.g. *stöiten-stöt*) is not represented in these diagrams. It would be attractive to relate the root contraction to the expulsion on the second tier vowel, i.e. as in (26) where the entire • — |U| remains unparsed, i.e. including the grid point.

(26) a. *stöita -stöt.*

```
V2-tier          |U|     |I|                    |U|      |I|
                  |       |                      |        |
             st • • t  +  •  t        →      •    st • t t        stöit+ Vt → stöt.
                 |/       |                             |
V1-tier         |A|-|I|  |U|                        |A|—|I|—|U|
```

This might be represented in a coplanar way (Archangeli 1985), where both tiers realize in one dimension with the V2-subsumed under the V1-tier, as in (26b).

(26) b. *stöita -stöt.*

```
             st • • t  +  •  t        →      •    st • t t        stöit+ Vt → stöt.
                 |/       |                   |         |
V1-tier         |A|-|I|  |U|                 |A|—|I|—|U|
                 |        |                   |         |
V2-tier         |U|      |I|                 |U|       |I|
```

In this representation, there is only one slot on the V2-tier, which is dominated by one spreaded element on the V1 tier. However, there is evidence for a reversed ordering with the V2-tier dominating the V1-tier. This can be extracted from the fact that upon expulsion the grid point, i.e. • and V2 must be adjacent: •—U. This implies that the coplanar ordering under (26b), if active at all, must come about by a late process of tier conflation. Alternatively, higher prosodic interactions with moraic and syllable structure might be involved. We leave shortening for further research.[10]

6. Toward a solution of the Epenthesis Conundrum

We are now in the position to solve the epenthesis conundrum. Let us first formulate it in observational terms. German has an epenthetic rule that inserts an epenthetic schwa whenever the stem ends in a [t/d] and/or [s/ʃ] and the ending contains with [t] and/or [s]. This is similar to English *he tosses*, instead of the expected *he tosss* or English *lan*[dɪd] instead of lan[dd]. A typical contrast is given under (27ab). Curiously, and this is the conundrum, when the root shows vowel alternation, as happens in 23sg of present tense, schwa epenthesis is absent in (27cd) (cf. Van Lessen-Kloeke 1982, Wiese 1986:713, Scheer 2016), which can be compared with *hide-hid/*hidded* in English. This anti-correlation is independent of the number of consonants and the vowel quality.
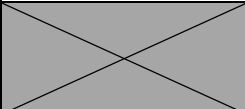
(27) a. spielen 'play'   spiel- + t   → spielt
                              spiel- + st   → spielst

---

[10] See, for instance, higher prosodic treatments of subtractive in Trommer & Zimmerman (2015) and D'Alessandro & Oostendorp (2016). There are fundamental problems in these accounts though, whence the lower prosodic analysis in this paper was developed. See section 8.

b.	spalten 'split'	spalt- + t	→ spalt**e**t
		spalt- + st	→ spalt**e**st
c.	h**a**lten 'hold'	h**ä**lt- + t	→ hält
		h**ä**lt- + st	→ hältst
d.	tr**e**ten 'step'	tr**i**tt- + t	→ tritt
		tr**i**tt- + st	→ trittst
e.	f**e**chten 'fight'	f**i**cht + t	→ ficht
		f**e**cht + t	→ fecht**e**t

Notice that both types of vowel alternations (|I|-addition and |A|-subtraction) participate in this pattern, despite the different origin of these alternations. Synchronically, however, there is, as we have seen in section 1 and 2, addition of |I| in both verb classes. This suggests a synchronic relation between epenthesis and |I| addition. The synchronic nature of the correlation is confirmed by the fact that when roots have optional vowel alternation, the form with vowel alternation lacks epenthesis and the form without vowel alternation displays epenthesis, as in (27e), taken from (Scheer 2016). Mixed cases, such as *fichtet or *fecht are not found. The strict complementary distribution of epenthetic schwa and vowel alternation suggests that these surface phenomena are exponents of one and the same underlying property.

As to the West-Germanic dialectology, notice first that Dutch, Frisian, Pomeranian, and the Low-Saxon dialects in the Netherlands do not have epenthetic vowels in the contexts under scrutiny at all, and resolve the -t+t-clash by degemination or, as happens in the dialects of Twente, simply have a "thick T" in this context (Van der Velde 1994:70). Dutch do not have umlauted 23sg forms, but Pomeranian, Low Saxon, and Limburgian do exhibit vowel alternation but do not show epenthesis. Frisian has sometimes deviant forms in 23sg (*ik meitsje-du makkest-hy makket* 'I/you/he make(s)'), but no morphological umlaut. Moreover, Frisian schwa between root and ending is a property of a separate verbal class (the so-called *je*-verbs), not a phonological effect. Hence we listed Frisian in the [-epenthesis, -umlaut] class together with Dutch. Finally, I added Yiddish which lost both umlaut in 23sg present tense and epenthesis (Albright 2006).

(28)   *Dialectology of epenthetic schwa in 23sg present tense in West Germanic*

| Dialect Chart	+ epenthesis	- epenthesis
+ I-umlaut	High German Low German	Pomeranian Low Saxon Limburgian
- I-umlaut		Dutch Frisian Yiddish

The chart under (28) shows that epenthetic schwa comes about in a subset of the languages with i-umlauting forms in 23sg present tense. In languages without I-umlaut in 23sg, epenthetic schwa is absent. This shows that schwa-epenthesis is dependent on 23-umlaut *in the language* despite the fact that epenthesis does not show up precisely when there is 23-umlaut *in a specific verb*. This can be explained by assuming that, synchronically, schwa epenthesis lexicalizes the vocalic trace of a 2/3sg *morpheme*, e.g. -|I|-st, whose melody has incorporated into the verbal stem when the stem displays umlaut. It suggests the structural identity of umlaut and schwa epenthesis. We, therefore, define umlaut as a structure in (29) which includes a floating umlaut factor together with a schwa on the V1-tier. This has no consequences for the derivations in the previous pages.

(29)   *Umlaut suffix in High and Low German*
       V2-tier |I|
                       |
                      •—
                       |
       V1-tier |@|
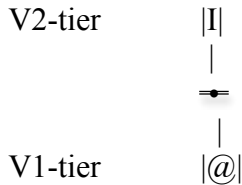
Now, one might be tempted to formulate epenthesis as a rule under (30), which activates the grid point. However, this cannot be correct as it will provide |I| with prosodic space and removes its floating nature.

(30)   *Epenthesis (rejected)*
       V2-tier |I| |I|
                       | |
                      •—   →   •
                       | |
       V1-tier |@| |@|
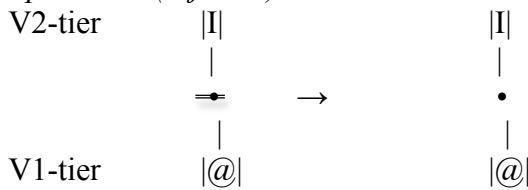
Instead, we retain the deactivated grid point •— and just add the licensing conditions under (31).

(31)   a. |@| (on the V1-tier) can realize on a deactivated gridpoint as [ə], provided it is
              licensed according to (14).
       b. |I|, |A|, |U| elements, and |@| on the V2-tier, need a full grid point for
              exponence.

The extra provision in (31a) just repeats the licensing of |@|, in situ in weak verbs, and spreading to the stress in strong verbs. We now apply the phonetic spellout rules in (32).

(32)   a.   *Spell out Rule for High/Low German*
              X•—Y is spelled out as [XəY] iff X≠Y, else as [XY]
                |
               |@|

       b.   *Spell out Rule for Pomeranian, Low Saxon, and Limburgian*
              X•—Y is spelled out as [XY]
                |
               |@|

In other words, High and Low German on the one hand, and Pomeranian, Low Saxon and Limburgian on the other hand, have the same underlying phonological representation with umlaut underlyingly present while they differ in their phonetics. Dutch and Frisian (and perhaps Yiddish), on the other hand, are underlyingly different because they do not have the umlaut configuration and do not need these spellout rules. For notational convenience we use the shorthand in (33) to represent the difference in behavior between |@| and |I| in (31). It expresses that |I| is floating while |@| has an anchor with respect to •— .

(33)   *Epenthesis (notational)*

```
      |I|                    |I|
       |                      ⊤
       •         →            •
       |                      |
      |@|                    |@|
```

As we have shown in section 1, both verbs with I-umlaut (*raten* 'guess' *lassen* 'let', and the verbs with A-umlaut (*geben* 'give', *treten* 'step', etc.) have the I-element in the ending, i.e. it is |I|+t and |I|+st. The representations are given under (34-35). We assume |I| to realize on the V2 tier as it is empty in the case of *raten*.

(34)   V2 tier

```
                         |I|              |I|
                          |                |
              r • t  + • t   →      r • t • t              rat+it  → rät
              |     |                   |
   V1 tier   |A|   |@|              |A|—|@|
```

This structure would become (35) upon epenthesis and spreading. This structure is, however, ill-formed.

(35)   V2 tier

```
              |I|            |I|                   |I|
               |    (28)      |   ⊤      (14)       |   ⊤
      r • t • t   →    r • t • t   →      r • t • t     rätt    → *rätet
      |   |                |   |                   |✹ |
   V1 tier   |A| |@|        |A| |@|               |A|  |@|
```

The reason is that if an epenthetic schwa realizes between stem and suffix, its |@|-part must spread to the root (because of licensing, cf. (14)). This spreading violates alignment, as there is no empty gridpoint available. Hence epenthesis is not well-formed.

Similar relations hold in the A-umlaut class. As we have seen, these have an |I| umlaut as well (which expulses |A|). It sits on the V2-tier as there is |I| on the V1-tier (OCP). The representations are under (36-37).

(36)   V2 tier

```
           |A|     |I|          |A|     |I|
            |       |            |       |
          tr • t  + • t   →     tr • t  • t         tred+it → tritt
            |       |                   |
   V1 tier |I|     |@|          |I|—|@|
```

Upon epenthesis, this stucture would give rise to the ungrammatical (37): The |@| element must spread for licensing but spreading |@| on the V1 tier is incompatible with alignment.

(37)   V2 tier |A| |I| |A| |I|
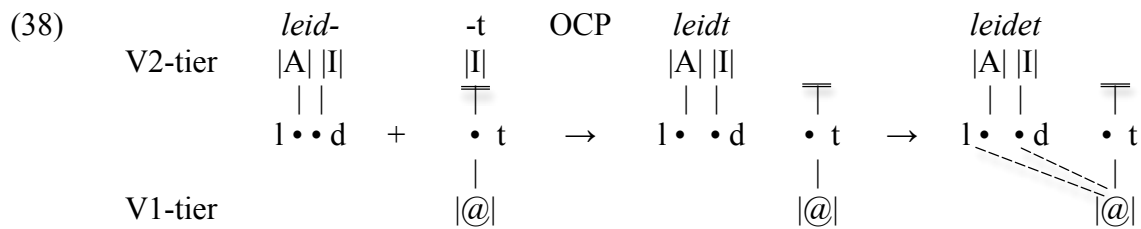
```
                   |       ⊤                 |      ⊤
          tr • t  + • t   →          tr • t • t        trit-+ət → *trittet
            |       |                    |✹ |
   V1 tier |I|     |@|                |I|    |@|
```
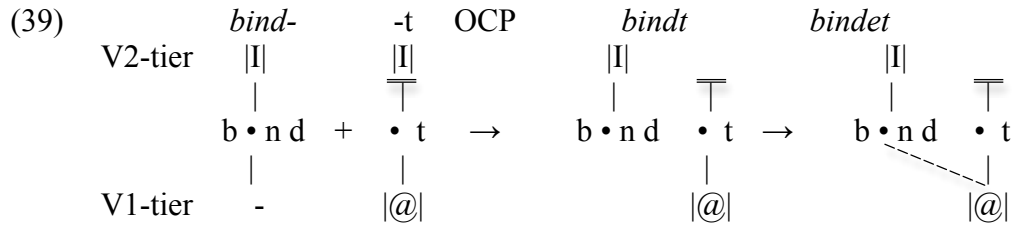
Let us finally observe the class of strong verbs that surprisingly have epenthesis in 23sg. These are typically verbs with [i] in the root, be they lax or tense monophthongs (*bitten* 'request', *bieten* 'offer'), diphtongs (*leiden* [ai] 'lead'), or vowel nasal combinations (*binden* 'bind'): they realize epenthetic *(er) bittet/bietet/leidet/bindet* '(he) requests/offers/leads/binds'. The broken nature of [ai] in *leiden* might be taken as an indication that these elements realize on the V2-tier.[11] In these circumstances, there is an adjacent realization of two |I|-elements, one of the root and one of the suffix. Thus far we did not encounter this state of affairs. Various aproaches are possible. We hold the OCP responsible for the non-alternating nature of these verbs: the OCP obligatorily reduces the two adjacent |I|s to one |I|. Evidence for this is that heterorganic diphthongs [ai], [oi] and [ui] are unaffected by mutation in Pomeranian. One could also say that already umlauted forms are not susceptible for a second umlaut cycle. This means that the OCP prevents expulsion of an element by an identical element, provided they are adjacent.[12] The structures are drawn under (38-39).

(38)

```
              leid-        -t    OCP    leidt               leidet
 V2-tier     |A| |I|      |I|          |A| |I|            |A| |I|
              | |          ⊤            | |    ⊤            | |    ⊤
             l • • d  +   • t    →     l •  • d   • t  →   l •  • d   • t
                          |                    |                        |
 V1-tier                 |@|                  |@|                      |@|
```

As to the epenthetic schwa, the V1-tier is completely empty and the |@| element can spread to the root for licensing. A similar strategy is available with *binden* 'bind'. This has been drawn under (39).

(39)

```
              bind-       -t  OCP     bindt            bindet
 V2-tier      |I|        |I|           |I|              |I|
               |          ⊤             |     ⊤          |     ⊤
             b • n d  +  • t   →      b • n d   • t  →  b • n d   • t
               |          |                   |                 |
 V1-tier       -         |@|                 |@|               |@|
```

This partially[13] solves the epenthesis conundrum by means of the competitive V2-tier model. In the next section we discuss an apparent exception of our hypothesis that the V2-tier is competitive.

7. The reality of the expulsed element

There is an intriguing exception to the mono-valued nature of each grid point on the V2-tier: the German verb *erlöschen* 'to be extinct'. It shows an I-A-U ablaut sequence on the V1 tier

---

[11] Dialects that have [ɛi], realize |A| on the V1-tier. This allows |I| to spread on the V2-tier, giving rise to |A|—•—|I| on the first grid point. This has no consequences for the epenthesis analysis.

[12] A potential problem looms upon including ablaut into this system, in view of the expulsion of |A| (± shortening) upon past tense formation [ai] → [i(:)]: *meiden*-m[i:]d 'avoid(ed)', *leiden-litt* 'suffer(ed)'. |A|'s expulsion might come about by |@| along the lines of (18b) above. The variable shortening in this class suggests variability in coplanar ordening upon tier conflation, V2 dominating V1 or *vice versa* (see also the discussion at the end of section 5). We leave ablaut for further research.

[13] Notice an asymmetry in the system. We do derive that absence of epenthesis is possible when epenthesis is forbidden. We fail to derive why epenthesis is obligatory when it is possible. I take this as a remaining imperfection, as I hesitate to invoke considerations of economy or optimality.

and a complex "parasitic element" |A|—|U| on the V2-tier. It suggests that the V2-tier may host a complex object, composed of two elements.

(40)
		erlöschen [ɛrløʃən]	erlosch [ɛrloʃ]	erloschen [ɛrloʃən]
V2-tier		|A+U|	|A+U|	|A+U|
		|	|	|
		ɛrl • ʃ	l • ʃ	ɛrl • ʃən
		|	|	|
V1-tier		|I|	|A|	|U|

This complex |A+U|, however, behaves like a single element upon I-umlaut in 23sg present tense, giving rise to *erlischt* 'he is extinct', as represented under (41).

(41)   V2 tier |A+U| |I| |A+U| |I|
                             | | |
                   er l • ʃ + ⇢ t   →   er l • ʃ   t   erlösch+it → erlischt
                             | | |
          V1 tier |I| |@| |I|—|@|

This verb, therefore, violates the calculus permitted in the V2-tier formalism.

Notice, however, that the ablauting nature of this verb is dependent on the presence of the *er*-prefix: the verb without the particle, *löschen* 'extinguish', is not apophonic and not alternating. Moreover, it is causative. In similar causative pairs, where the base is apophonic and its causative derivative is not, like *sitzen→setzen* 'sit/set' and *liegen→legen* 'lie/lay', the causative morpheme is realized by adding |A| to the root.[14] In the case of *erlöschen→löschen* there is not such a stem opposition: one would rather expect *lüschen→löschen*. This makes it probable that the |A| part in the stem *erlösch-* is only seemingly there: it may parasitic of the |A| element in the prefix *er-*. If so, the umlauted form *erlischt* falls into place. The full representation is given under (42).

(42)   erlösch+ it   erlischt
          V2 tier |I| |U| |I| |I| |U| |I|
                       | | | | | |
                       • r -   l • ʃ + ⇢ t   →   • r -   l • ʃ • t
                       | | | | |
          V1 tier |A| |I| |A| |I|

Observe that the expelled |U| intervenes between prefix and root and prevents V1-tier spreading of |A|. The loss of |A|, therefore, does not come about upon direct expulsion but upon blocking of spreading. This reduces our exception to a standard competitive effect on the V2-tier. The configurational blocking of |A|-spreading shows the reality of the expelled |U| element in the underlying representation, despite its lack of exponence in *erlischt*: without the intervening silent |U| we would predict *erläscht*.

The V2-tier analysis + prefix interaction also provides the structure of some German modal verbs, such as *mögen-mag* '(he) may' and *können-kann* '(he) can', with a similar interaction with a prefix.

---

[14] Cf. Gothic *lithan* 'go' and *laidjan* 'lead'.

(43)   *könnnen-kann-kannst-kann & mögen-mag-magst-mag*

          PFX   *(ver)mög-*   -e   PFX   *(ver)mag*

V2-tier |U| |@| |U| |@|
                      | | | |
     (v)—•(r)   m • g   + —•(st) → v—• r   m • g   —•
           |_ _ _ _ _ _| | |
V1-tier |I| |A| |I| |A|
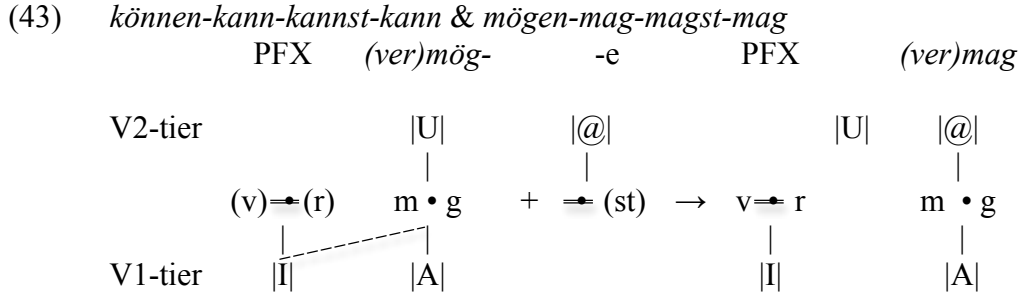
Evidence for (silent) presence of a prefix is the incompatibiliy of *können* with overt prefixes (**be-/*er-/*ent/*ge-/*ver/*zer-können*), and an optional dummy prefix *ver-* in the case *(ver)mögen-(ver)mag*. Notice that these modal (so-called "present-preterit") verbs use the subjunctive endings -e/-est/-e. If the vowel is floating, it produces the *kann-kannst-kann*, while the anchored vowel produces the subjunctive paradigm: *könne-könnest-könne*.

8. Previous accounts

Though subtractive morphology has received attention of Bloomfield (1933), Hockett (1954) Kaye & Morin (1978), Bye & Svenonius (2010), Birkenes (2014), we here only discuss two recent accounts by Trommer & Zimmermann (2015), henceforth T&Z, and by D'Alessandro & Van Oostendorp (2016), henceforth D'A&vO because our account is very much in the spirit with these approaches. These studies attribute (apparent) subtractive effects to the *addition* of an affix that is prosodically defective. In both proposals (which is stated in terms of Optimality Theory in T&Z), there is a double defectivity which consists of a mora without segmental content and without syllabification. The former defectivity causes it to "eat'" segmental material and the latter defectivity blocks it from being parsed and, hence, from phonetic realization. Let us illustrate the account with perfect formation in Tohono O'odham in (44), taken from Fitzgerald & Fountain (1995:5ff *apud* T&Z:4).

(44)

imperfect	perfect	gloss
ñeok	ñeo	'speak'
ma:k	ma:	'give'
dagsp	dags	'press with hand

As we inspect from (44), the last segment of the stem is subtracted upon perfect formation. As T&Z argue, this apparent truncation is in fact addition, i.e. addition of a defective suffix which "eats" the last segment. Before going into the details, we first list the basic ingredients of the model. We here follow the slightly simpler system of D'Alessandro & Van Oostendorp (2016), which is basically T&Z account recast in a non-OT framework, i.e. with non-violable principles. D'A&vO assume the following principles:

(45)   a. Every mora should be linked to something (either higher-order prosody or segmental material)
        b. A consonant[15] cannot be linked to more than one mora.
        c. A syllable cannot host more than three moras.

---

[15] D'A&vO have here: "a segment", which cannot be correct in view of the spreading in (37) where the segment /a/ is associated with two moras. T&Z apply the principle to consonants only. Abruzzese however, disallows for long vowels, and the extension to vowels (and hence to |A|) and segments in general applies to Abruzzese.

Let us now show that these (rather uncontroversial) principles give the desirable results. Consider the prosodic representation under (46).


(46)
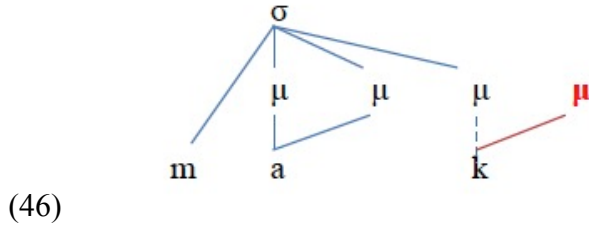
The stem /ma:k/ consists of a syllable (σ) that consists of three moras (μ), i.e. it has the maximal syllable size. If a defective mora is added (drawn in red), it must link up with either σ or with a segment (to comply wit (45a)). As the first option is unavailable because of syllable maximality, it links with the final consonant, which is the closest (red line). As this consonant may not be dominated by two moras, it is delinked from its own mora (dashed line). The result is licit because this mora only needs *one* association line, in this case association with σ. As the final /k/ and its stray mora is not parsed in terms of higher prosodic domains, it remains without exponence.

 D'A&vO apply this to metaphony in masculine nouns and adjectives in Abruzzese (see Passino 2016 for the patterns), e.g. *mese→mise* 'month(s)', where an |A|-element is subtracted from the root upon plural formation. Just as in the case of (46), they assume the addition of a stray mora, which links to an *element* in the sense of Element Theory, i.e. segment's sub-structure instead of a *segment*. This is given under (47). The reason why the stray mora (in red) cannot be linked to the nearest σ, is a bit different in Abruzzese, but the mechanism to save it, is parallel: the mora's eating of phonological material.

(47) a. mese   b. mise
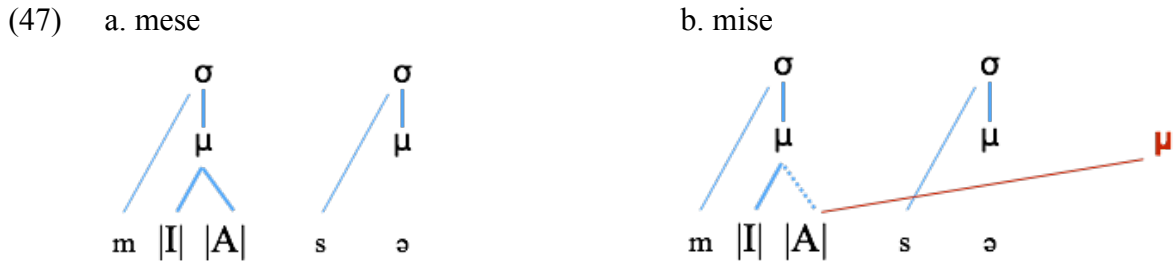
Without discussion, both T&Z and D'A&vO assume that syllablified structures are present in the underlying representation, i.e. they have embellished the Lexicon with full (basically redundant) prosodic trees (*contra* Steriade 1999, Scheer 2002, but *pace* Vaux 2003). Secondly, they implicitly assume that the defectiveness can **not** be dynamically resolved by adding prosodic entities, e.g. a syllable. So they implictly exclude epenthetic syllables as in (48a and b), which are drawn gray as it is colorless in terms of T&Z and D'A&vO).

(48) a.   b.
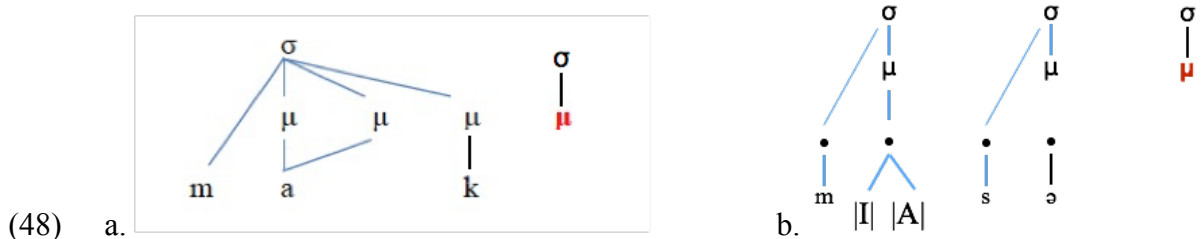
T&Z ignore the possibility of epenthetic syllables despite the fact they allow for it in principle in their example (11). They treat syllable structure as if it were a conserved property and ignore that all morpho-phonological theories allow for late syllabification and late (re)syllabification (e.g. *continuous syllabification*, Booij 1995). This is a process in the phonology, i.e. after lexical insertion, for instance to account for resyllabification accross word boundarries, e.g. Portuguese *moços* [mɔsuʃ] boys' versus *moços anciosos* [mɔsuzãnciɔsuʃ] 'fearful boys', where the change from [ʃ] to [z] shows that the syllable final /s/, realized as [ʃ], is resyllabified. Well, late (re)syllabification provides us with the configuration in (48), which has the same exponence as the original input *maak,* and Abruzzese *mese* i.e. without subtraction. In (49) we listed evidence from Dutch showing that 1. resyllabification exists and 2. that the number of syllables structure is not a conserved quantity.

(49) a. mol-molair $(mɔl)_σ + (ai)_σ (r)_σ → (mo)_σ(lai)_σ(r)_σ$ 1+2→3
      b. paar - pariteit $(paa)_σ(r)_σ + (i)_σ (tei)_σ (t)_σ → (paa)_σ(ri)_σ(tei)_σ(t)_σ$ 2+3→4
      c. statuut - statutair $(staa)_σ(tuu)_σ(t)_σ + -(ai)_σ(r)_σ → (staa)_σ(tuu)_σ(tai)_σ(r)_σ$ 3+2→4
      d. elite - elitair $(ee)_σ(li)_σ(te) + -(ai)_σ(r)_σ → (ee)_σ(li)_σ(tai)_σ(r)_σ$ 3+2→4

In (49a) we see that the final /l/ in /mol/ changes its syllable, as it changes from being in a closed syllable to the onset, and the preceding vowel changes from closed syllable [ɔ] to open-syllable [o]. In (49bcd) we see that resyllabification does not preserve the number of syllables. Whereas we see deletion of syllables in the above examples, addition of syllables with epenthetic material also occurs, for instance in Dutch diminutives with lax vowel stems.

(50) a. $(maa)_σ(n)_σ + (tje)_σ$ → $(maa)_σ(n)_σ(tje)_σ$ 'little moon'
              'moon + DIM'
      b. $(man)_σ + (tje)_σ$ → $(man)_σ(ne)_σ(tje)_σ /*(man)_σ(tje)_σ$ 'little man'
   'man + DIM'

In general, it is difficult to see how defectiveness can be stated in terms of entities that are not preserved during the derivation or can be assigned postlexically. In order to avoid resyllabification, Van Oostendorp (*pers. comm.*) must assume that resyllabification is blocked by a domain restriction. Hence, they must assume that the addition of the stray mora occurs outside the domain (probably a *phase*) where resyllabification, stress shift, etc. may apply (Lowenstamm 2010, Creemers, Don & Fenger 2016). However, if the root and the defective mora are in distinct phases, it is difficult to see how the spellout of the root can change from [e] to [i] upon association of |A|. A further problem is the fact that syllabification is not universally domain-restricted. Admittedly, it is domain-restricted in Dutch, but it is not precisely in Italian, and Romance in general (Vigário 2003: 35ff), as we saw from Portuguese sandhi example above.

There is a further problem with the concept of a mora that eats an *element*. As can be seen from (47b) the stray mora attaches to the closest prosodic entity to its left. Essential is, therefore, the fact that the first available vowel is schwa, i.e. there is no association line between the segment (schwa) and higher prosodic domains. For that reason the rescuing association line takes the next candidate. However, it is not clear why, upon searching a candidate, the association line may skip the root node level, not drawn in D'A&vO but added in (51).

(51)   a.   b.
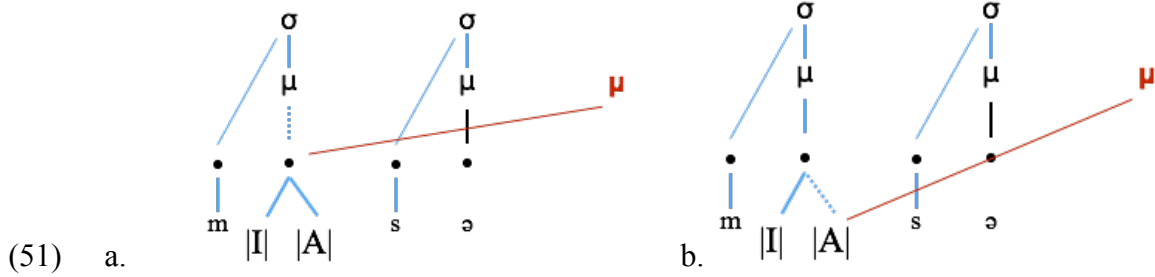
The expected structure in (51a) predicts [msə] or [məsə] as an output, instead of the observed [misə]. Instead of the closest candidate, D'A&vO de facto assume (51b). This can easily be corrected in an OT-account by adding a higher ranked constraint of word minimality, but it cannot be done in D'A&vO's account with unviolable principles. Furthermore, association between moras and elements, skipping the grid point, violates the strict prosodic hierarchy (Nespor & Vogel 1986), which these authors otherwise adopt. Notice further that the delinking of the dashed in (51a) is predicted by Principle (45b), but not the delinking of the dashed line in (51b). This shows that D'A&vO's model, though it partly explains the Abruzzese facts, has formal imperfections.

It is essential in the two accounts discussed above that the stray mora lacks syllabification **and** it does not dominate segmental material. This prohibits generalization over addition + subtraction, as was the challenge of (5). However, as we have seen, |A| subtraction in Pomeranian goes hand in hand with addition of other material, e.g. *kooma - kümt* (where |A| is subtracted **and** |I| is added within one and the same morphological process. In T&Z and D'A&vO's framework, this must be broken up into two processes: the subtraction and the addition. This allows the following two orderings.

(52)   a.   k • m + μ   +▬▬ +t   or   k • m + ▬▬   + μ   + t
                | | | |
                |U|—|A| |I| |U|—|A| |I|
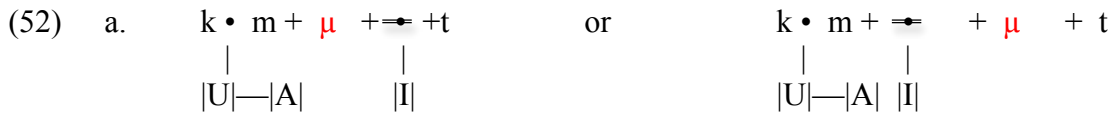
In order for |A| to be the closest to the moraic "eater" μ, the defective mora must be adjacent to the stem, i.e. the correct representation must be (52a), not (52b). However it is now far from clear why the floating umlaut factor |I| would not anchor to the floating mora, upon right to left alignment, which mora is then licensed because of (45a). This mounts up in adding nothing in the output. So, the order must be as in (52b). But now the mora can only eat the |I|.

Our treatment avoids these ordering problems: the subtraction comes about by the addition (competition on the V2-tier).[16] It profits from T&Z's idea of "subtraction as addition" of a prosodically defective structure, but instead of adding a high-level prosodic defectivity, we add a defectivity at the lowest prosodic level: between grid points and segmental material. From D'A&vO we adopt the idea that this defective prosodic suffix may affect the sub-segmental level: the defective structure subtracts an *element*. Contrary to D'A&vO, however, our account does not suffer from skipping a prosodic domain, since alignment occurs at the low level of elements and grid points. But the major advantage of the competitive tier model is that the very fact that *addition causes the subtraction*. This makes adding |I| and subtracting |A| in *geben-gibt* one and the same process.

We believe that the problems of the OT-account by T&Z as well as the principled account by D'A&vO can be captured more naturally and more elegantly by low-level

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[16] Because our competitive tier model is a model on *vowels*, it cannot replace T&Z's account of consonant subtraction. Our model only constitutes an alternative to D'A&vO application on vocalic material. The criticism raised in this paper, however, concerns both accounts.

defectivities, and it avoids the problems we have mentioned. At the same time, the empirical domain of our low-level account is considerably extended without making the model more powerful. Our vocalic model naturally applies to alternating verbs in German, but can also account for the Abruzzese facts in D'A&vO and the metaphonic facts in Romance (Torres-Tamarit *et al.* 2016). See the appendices.

9. Summary, conclusions and discussion

Competition of segmental material is inherent in all proposals of template satisfaction (Goldsmith 1976, McCarthy 1978, Steriade 1982, Marantz 1982, and subsequent work). Segments are aligned with a prosodic template and compete for prosodic space. In this paper we show that vocalic template satisfaction enforces competition of *elements*, i.e. template satisfaction applies on the building blocks of segments (in Element Theory). We have shown that — in terms of Element Theory — there must be two types of vocalic tiers: a conflating tier (V1-tier) where the addition of an element causes conflation, and a competitive tier (V2-tier), where addition of an element may expel another vowel from the prosodic template. This allowed us to solve the epenthesis conundrum, which describes the fact that epenthetic vowels are blocked in alternating present tenses, as well as the imperative conundrum, that describes that alternating verbs sometimes derive the imperative from the 23sg, sometimes from the non-23 form. The facts explained by the Competitive Tier Model are cast in the table in (48).

(48). Distribution of schwa in German paradigms (23sg present tense & imperative sg)

	infinitive				2sg present tense		imperative	
		strong/ weak	alternating in present	additive/ subtractive	ø-st	e-st	ø	e
class 0	spielen	w	no	n.a	ok	*	*	ok
class 1	arbeiten	w	no	n.a	*	ok	*	ok
class 2	raten	s	yes	+	ok	*	ok	ok
class 3a	lassen	s	yes	+	ok	*	ok	*
class 3b	treten	s	yes	⋈	ok	*	ok	*
class 4	leiden	s	no	n.a	*	ok	*	ok

Red ovals: Epenthesis Conundrum; green ovals: Imperative Conundrum. All cells are captured in the Competitive Tier Model.

We used the principles and assignments by the lexicon under (49) and the assignment by the Lexicon under (50):

(49)   **Principles**
      - Template satisfaction in the phonology (not the lexicon)
      - Alignment (i.e. competition of segments/elements)
      - Edge-In Alignment (from the highest affix inward)

(50)   **Assignments**

V1 tier	V2 tier
(vowels of...)	(vowels of...)
• weak verbs	
• strong verbs (I-A-U)	• parasitic element in strong verbs

- strong verbs A-I-A class, A-U-A class
(IE reduplication class)
- imperative morpheme (schwa)
- epenthetic schwa
- 23sg present tense morpheme: |I|+st and |I|+t
- in diachrony: |A| element in present tense suffixes

The foundation of these assigments is not entirely clear: what rules the assigment of segments to a specific tier? A connection with morpheme status seems at stake, at least historically. Suffixes seem to realize their vocalic material on the V2-tier and retain this assignment even after reanalysis as part of the root. The competitive nature of suffixes and the competitive nature of the V2 tier might, therefore, be related.[17] This can possibly been formulated in terms of color (Van Oostendorp 2006). Alternatively, the vowel's relation with consonants might be at stake, as was suggested in Postma (2014), where V2-tier |I| was identified with /dt/ and V2-tier |U| was identified with suffixal [g]. The consonantal nature of the V2-tier can also be extracted from the apparent intervening nature of epenthetic schwa between two heteromorphemic dentals, -tət/-dət. This schwa can only solve a consonantal OCP-problem if it is visible to the consonants or upon tier conflation. The competitive nature might also be a vocalic counterpart of the competitive nature of consonants in alignment processes. This might be realted to the simplicity of vowels in Semitic. Finally, the competitive nature might be related to headedness in the sense of Element Theory (Backley & Takahashi 1996, Backley 2011).

      Finally, it must be noted that it was in most cases |A| that was expelled upon tier alignment[18], whence D'A&vO's "|*A*|-eater". These authors attribute the tendency to associate with |A| to its high sonority. This might be an indication that a phonetic drift to segments with high formants F2 and F3 might be involved, cf. Enguehard (2016) for a discussion. The |A|-element has no particular status with respect to expulsion in our Competitive Tier Model.

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[17] For an interesting Berber case of *morpheme* competition by phonological template satisfaction, cf. Lahrouchi (2013).

[18] As was noticed by Diana Passino (*pers. comm.*).

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