Tone, Final Devoicing and Assimilation in Moresnet

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Abstract

In the Franconian dialect of Moresnet, accentuation shows up non-contrastively on short vowels followed by an obstruent. The tone is determined by the underlying voicing of the following obstruent, not by its surface realization. Neither Final Devoicing nor Voicing Assimilation seem to affect the accentuation on the vowel. We explore the theoretical implications of this opacity and demonstrate, first, that it requires a phonological model which is derivational involving at least two different levels, and that this in turn implies that the apparent interaction between voicing and tone in this dialect is not problematic for recent accounts which posit that Franconian dialects do not have a tonal, but rather a prosodic contrast.

1 Tone-voicing interaction in Moresnet

Several authors have been arguing in recent years that the 'tonal' Franconian dialects of West Germanic are not really tonal at all (see **????**, and references cited there), but display a prosodic contrast instead, although the authors mentioned do not agree as to what this contrast would be. Yet some modern dialects still display phenomena which seem problematic for such a view. One of these is that the contrast on short vowels in Moresnet is determined by the laryngeal phonology of the following obstruent. Typologically, this points in the direction of the contrast being tonal, since tone-voicing interaction is quite common in languages of the world, while prosody-voicing interaction (at least of this type) is not.

However, the Moresnet phenomenon interacts with the phonology in a complicated way, since it isn't the surface but the underlying specification of the laryngeal features which interacts with the tones, and this in turn happens in a complicated ways which defies a representational solution, as we will show below, requiring instead a rather complicated derivational pattern. We will discuss in what way this sheds light on the underlying representation.

2 Moresnet tonology

Moresnet, currently part of the municipality Bleyberg (Plombières), is a village of about 1300 inhabitants in the Belgian province of Liège. French is the most important official language in this area. The local dialect of Moresnet is however Germanic, and usually considered to be intermediate between Limburgian and Ripuarian; it is located to the west of Bernrather Linie, so that it has not undergone the spirantisation typical for Ripuarian dialects (**????**)

(1) a. Moresnet: [ut, ap, makə]
    b. Aachen [us, af, maxə]

Like dialects in the neighbouring region, Moresnet makes a lexical distinction between Accent 1 and Accent 2. In the case of long vowels or short vowels followed by sonorants, this leads to minimal pairs such as the following (I denote Accent 1 and 2 with superscripts):

(2) *doof*^{1} 'deaf' (F.SG.), *doof*^{2} 'deaf' (M.SG.), *leep*^{1} 'lip', *kreep*^{2} 'cradle', *zès*^{1} 'scythe', *zès*^{2} 'six'

Short vowels before obstruents also take part in this opposition, but the accent is not phonemic in this context, but always determined by the voicing of the obstruent following it: if this obstruent is voiced, we have Accent 1, and if it is voiceless, we get Accent 2.

(3) a. voiced obstr. = Acc. 1 ([bɛdə^1] 'beds')
    b. voiceless obstr. = Acc. 2 ([tɛpəx^2, kɛs^2] 'carpet', 'cash')

This correlation between voicing on the obstruent and tonal accent in itself is not surprising. Accent 1 is realized (in)contexts with a falling tone, and it is known that obstruent voicing has a lowering effect on F0. Therefore, having a word end in voiced obstruent will turn a level tone into a falling tone quite naturally at the phonetic level.

We can find the same correlation in many Limburgian dialects as well (**?**), at least at the phonetic level. It *is* a challenge for approaches which claim that synchronically the relevant contrast is prosodic rather than tonal, such as those mentioned above.

However, even more interestingly, this particular tonal opposition is not entirely phonetic in Moresnet, as it is 'opaque' — the tone is not dependent on the surface voicing of the obstruent, but rather on its underlying value for the feature [voice]. What is more, it is opaque in two different ways, i.e. it interacts with two different processes changing the underlying

value. First, the process of final devoicing has no influence, so that phonetically voiceless obstruents sometimes trigger Accent 1 (viz. when they are devoiced):[1]

(4) [bɛt^1] (</bɛd/ 'bed').

Secondly, voicing asimilation – a process which voices an obstruent when it precedes a voiced plosive — also has no influence, so that phonetically voiced obstruents sometimes combine with Accent 2 (viz. when they are underlyingly voiceless). Examples are voicing of a stem-final obstruent before the past-tense ending *-de* (**??**), before the derivational (nominalizing) suffix *-de* (**??**) and before the 2nd person plural enclitic *der* (**??**):

(5) a. [stɔbdə^2] 'stopped' (</stɔp/ 'to stop' + /də/ PAST)
b. [nɛdzdə^2]'wetness' (</nat/ 'wet' + /də/ N)
c. [brug^{2}dərdat^2] 'do you need that' (</bruk/ 'need' + /dər/ 'you' + /dat/ 'that')

In most other varieties of Franconian, the tone-voice correlation is not opaque but completely surface-true: e.g. Maasbracht Limburgian has [bɛt^2], [stɔbdə^1] (Ben Hermans, p.c.). Such an opaque interaction is probably more easy to understand from a prosodic point of view than the one in Moresnet: all the approaches mentioned above would at some point assign tones to the different prosodic structures in all Franconian dialects, simply because they are present at that level, and such surface tones could then interact with the laryngeal features of the consonants. It is the fact that there seems to be interaction with underlying tones which makes the Moresnet case more challenging.

3 Opacity

Opacity thus is the application of processes to a phonological form which refer not to surface properties of the form in question, but of 'deeper', more 'underlying' properties. Since it plays an important role in the discussion, we should devote some attention to it.

Opacity is a problem for phonological theories which orient themselves on the surface representation exclusively, like (classical) Optimality Theory (**?**). The definition most cited is by **?**:

(6) *Opacity* (**??**)
"A phonological rule R of the form A → B / C__ D is opaque, if there are surface forms, which show one of the following:

[1]Two further types of opacity, mentioned in **?**, is that Imperative Singular always has Accent 2, and the same is sometimes true for the first member of compounds. I will not go into this phenomenon here, interesting as it may be for a variety of reasons, because it does not involve the purely phonological type of opacity discussed here.

a. A in the context C_D
b. B derived from A, which appears in contexts different from C_D"

The interaction between tone and voicing in Moresnet shows both types of opacity. Let us assume for a moment that Accent 2 is always underlying (or that it is the default) and that the relevant rule is informally as follows:

(7) V → Acc. 1 /_ [+voice] (Accentuation rule)

(**??**) corresponds to (**??**): the rule has applied in a 'wrong' context, while (**??**) corresponds to (**??**): the rule seems to have not applied, even though its context is met. (Assuming that Accent 1 is underlying and that there is a rule converting it to Accent 2 in [-voice] contexts leads to the same double opacity.)

Rule-based analyses have no problem with this type of situation: we just need to stipulate that (**??**) precedes the two other processes involved, final devoicing and voicing assimilation:

(8) a. [+voice] → [-voice] /# _ (Final devoicing)
b. C → [+voice] / _ [+voice] (Assimilation)

If rules (**??**) and (**??**) apply after (**??**) in Moresnet, the Accentual rule just does not feel the presence of these other processes. In other dialects the order could be the other way around.

In constraint-based systems, such as OT, the issue becomes more difficult since processes are never ordered, and they are supposed to be all sensitive only to the surface. There are two roads one could deal with opacity in these cases (see **?**, for an overview): one could mimic the derivation and organize the phonology into several steps, or alternatively one could enrich the representation. The latter is an approach I have defended in previous other works (**???**), but I think it is untenable in this case. I will try to show this, by working out a representational account first, discussing what its problems are and then moving to a derivational solution.

4 A representational solution

A representational solution to an opacity problem typically implies that we show that the two opaque processes are not different, or at least that they are not independent, so that they do not have to be ordered. In the case at hand, if we could establish for instance that final devoicing and the accent shift are really two sides of the same coin, they can happen at the same time and we do not have to establish an ordering relation between them.

We can draw the relation if we accept the hypothesis that Low and Voice are instances of the same feature. One implementation of this is to accept

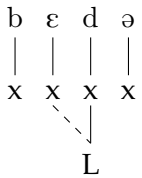
that both the low tone on vowels and sonorants and voicing on obstruents can be phonologically marked with the feature 'L' (**?**); the precise phonetic implementation of this feature would thus depend partially on the segment on which it is realized — but that is not uncommon (the [high] vowel [u] in a given language is not necessarily exactly as high as [i]) (**?**).

Further we have to claim that it is impossible to completely *delete* this feature in Moresnet; final devoicing would be able to move it away, but not to take it out of the representation altogether. It would therefore move to the tonal node, accounting for the falling tone on a short vowel followed by an underlyingly voiced consonant.

Note that this solution only works if we assume that the accentual contrast is somehow tonal. Here is a concrete way of working out this solution. We assume that having Accent 1 implies the presence of a low tone, whereas Accent 2 is underlyingly toneless. Other surface tones would be added by phonetic realisation rules or are due to intonation. Drawing the distinction in this way seems warranted for independent reasons (**?**); for instance, Accent 1 is morphologically more marked than Accent 2 (the former can morphologically mark the plural, and furthermore in many minimal pairs the Accent 1 form is a lexical word, while Accent 2 marks a function word).[2]

We can now analyse the normal, non-opaque effect as an instance of autosegmental spreading of the feature L:

(9)



In Optimality Theory, we can see this as the interaction between three constraints"

(10) a. MAX-L: The feature L should not be deleted
b. IDENT-L: The feature L should not be realized on a different segment than that on which it has been underlyingly specified
c. SPREAD: vowels and adjacent voiced obstruents share the feature L

[2]The fact that the imperative is marked by Accent 2 in Moresnet seems to run counter to this observation, because it implies that Accent 2 can be used to actively mark a contrast, but notice that it is exactly the imperative which in many languages is expressed by truncation (**?**).

(11)

	bɛdə	Spread	Max-L	Ident-L
a.	bɛ^{1}tə			**!
b. ☞	bɛ^{1}də			*
c.	bɛ^{2}tə		*!	
d.	bɛ^{2}də	*!		

Two configurations satisfy SPREAD: one in which a vowel is followed by a voiceless consonant, and one in which the voicing (the feature L) of the consonant is shared by the vowel. If a vowel is followed by an underlyingly voiced consonant, this can be resolved in one of two ways: by delinking the voicing (violating MAX) or by spreading to the vowel (violating IDENT). The choice is resolved in the familiar way: by ranking of the two relevant constraints.

The interaction with Final Devoicing can now be easily captured by ranking the constraint responsing for it on top of the subhierarchy we have already established:

(12) FINDEV: L is not allowed on a word-final (syllable-final) obstruent

(13)

	bɛd	FinDev	Spread	Max-L	Ident-L
a. ☞	bɛ^{1}t				*
b.	bɛ^{1}d	*!			*
c.	bɛ^{2}t			*!	
d.	bɛ^{2}d		*!		

The fact that FINDEV is high ranked, forces delinking of voicing on the final consonant. Given that MAX requires the feature to be preserved, this delinking at the same time leads to a linking of the feature to the vowel.

This representational analysis has several advantages. First, of course, the 'opaque' interaction is not really opaque, but a consequence of the representations involved, plus the independently established constraint ranking. Secondly, all constraints involved are independently motivated for Moresnet as well as for other dialects.

Unfortunately, however, there are also some disadvantages. First, there is no formal relation between spreading and the tonal effect of final devoicing: the latter is not really spreading but a movement of the feature to a different position. This implies that one would also expect language systems — for instance, other Franconian dialects — without spreading but with the tonal effect of final devoicing; those have not been attested.

Other dialects possibly have a different ranking of IDENT and MAX:

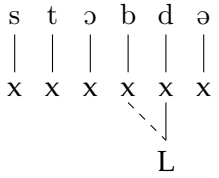
Tableau: other dialects

(14)

	bɛd	FinDev	Spread	Ident-L	Max-L
a.	bɛ^{1}t			*!	
b.	bɛ^{1}d	*!		*	
c. ☞	bɛ^{2}t				*
d.	bɛ^{2}d		*!		

In addition, and possibly even more importantly, the representational approach does not offer a solution of the other opacity problem, viz. the one involving assimilation. Under autosegmentalist assumptions, assimilation should be analysed as spreading of the L feature, which can be depicted as follows:

(15)



Assimilation is a problem for our account, because it is not clear why an obstruent which is voiced as a result of assimilation should not have the same effect on the preceding vowel as an obstruent that is 'underlyingly' voiced. In verbs with an underlyingly voiced obstruent, accentuation is possible:

(16) [tɔ^{1}bde] (</tɔb/)

We would have to assume, for instance, that L cannot spread more than once, so that e.g. we have to adopt a constraint such as:

(17) DOMAIN: The domain of L is binary at most (one L feature cannot be linked to more than one position).

There is however no independent evidence for such a constraint in the Moresnet dialect, and its status as a universal constraint is questionable at best (**?**).

Finally, there is no conceptual relationship between the constraints DOMAIN and MAX-L, the two constraints which are responsible for the opacity effects: this obviously makes the factorial typology become bigger, and one might argue that it becomes too big: we predict languages like Moresnet which are opaque only in the context of final devoicing, or only in the context of assimilation, whereas all we have in reality is a system which features both types of opacity at the same time.

It seems difficult to solve any of these problems, since they all seem inherent to the representational approach. The issue is that the L feature

works as a memory device: even though it is no longer there on the surface, it still affects the vowel in the same way as a voiced consonant would.

5 A derivational solution

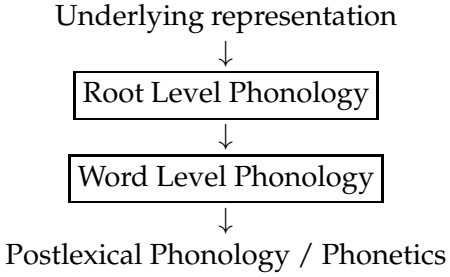
If we cannot find the solution within one representation, we may try to find it in the assumption that there are two representations: one in which the underlying specifications for voice are untouched and Accentuation can play an unlimited role, and one in which devoicing and assimilation have worked before Accentuation.

In the course of the past 15 years, many suggestions have been offered as to the solution of opacity problems within Optimality Theories. The most influential current ideas are both derivational: in our case, we would say that we apply the accent shift first, and then final devoicing and assimilation, just as in the rule-based solution sketched above.

The first such proposal is so-called Stratal Optimality Theory (**???**), which distinguishes between (typically) three levels of phonology: stem-level, word-level and sentence-level. Those phonologies apply serially. If we say for instance that the accent shift rule applies at stem-level, we can say that the other two processes are postlexical. The alternative proposal would be found in so-called OT-CC (Optimality Theory with Candidate Chains **?**) in which there is also extrinsic rule ordering, but without the link to morphological status.

Of these two, Stratal OT seems the more attractive, for instance since it is more restrictive, and it allows for an explicit relationship with syntax and semantics. (That also differentiates such an approach from the rule-based one in which no such link is necessary.) Let us for the sake of concreteness adopt a standard SOT model with three levels of representation:

(18)



Assuming that none of the processes involved here are postlexical (they all seem to work within the word, although some more work would need to be done on the special status of the clitic *der*), we could propose the following stratal phonology of Moresnet, working with the constraints already introduced above:

(19) a. Root-level Phonology: SPREAD≫IDENT-L≫ FINDEV:

- /bɛd/→/bɛ^{1}d/
- /stɔp/→/stɔp/

b. Word-level Phonology: FINDEV,ASSIM≫IDENT-L ≫SPREAD:

- /bɛ^{1}d/→/bɛ^{1}t/
- /stɔpdə/→/stɔbdə/

At the root level, SPREAD is dominant, forcing the vowel to agree with the following consonant, but otherwise all changes to an underlying specification of L are blocked by a highranking IDENT-L constraint (so that no spontaneous accentuation could happen in other words). At the word-level, things work the other way around: the constraints in favour of devoicing and assimilation outrank the faithfulness constraint.

Furthermore, we can assume that at the root-level, the relevant affixes are not yet visible to the phonology, so that the relative ranking of the constraint ASSIM is irrelevant at this level (there will be no context for this constraint).

In transparent dialects, on the other hand, all the relevant constraints apply at the same level. This needs to be the word-level since also in these dialects the inflectional suffixes need to be present before ASSIM will take any relevant effect.

(20) a. Root-level Phonology: IDENT-L≫FINDEV,SPREAD:

- /bɛd/→/bɛd/
- /stɔp/→/stɔp/

b. Word-level Phonology: FINDEV,SPREAD,ASSIM≫ IDENT-L:

- /bɛd/→/bɛ^{2}t/
- /stɔpdə/→/stɔ^{1}bdə/

Some interesting predictions follow from a 'stratal' analysis, which can readily be tested. In particular, the relation between tone and voicing should be part of the 'deep phonology' in Moresnet, i.e. it should apply at an early lexical level. Given this, there might be lexical exceptions. Such exceptions are indeed mentioned by **?**, who claims to have found 'about fifty' words with a short vowel followed by a voiced consonant and Accent 2. Most of these end in a sonorant (**??**), but there also are some words with a voiced fricative (**??**) (there seem to be no exceptions with a plosive):

(21) a. kastaŋ^{2}əl 'chestnut', mœr^{2}əjə 'tomorrow', hu^{2}məl 'bumblebee'

b. ɔ^{2}vənt 'evening', brœ^{2}zələ 'talk nonsense'

Similar exceptions do not seem to be attested in other Franconian dialects, and this on its own is an argument in favour of a derivational approach, as

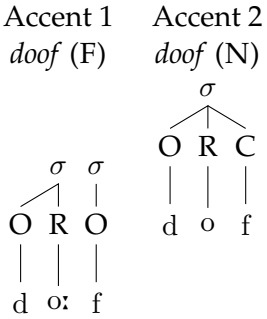
a representational account seems unable to make a similar prediction.[3]

Another consequence of pursuing the derivational account is that the initial motivation for equating Low tone and voice disappears: we needed the abstract L feature as a 'memory device' when we set up a representational account. Such representational accounts will typically build representations which are slightly more complex and/or abstract (because one representation has to do the work which several representations together can do in a derivational account). In this particular case, we needed the L to mark the fact that the voicing was there on the consonant, even though it is no longer expressed there. Furthermore, the account is elegant because it allows us to express the purely phonetic influence in other Franconian dialects in a similar way.

However, given that we no longer need the representation to work as a memory device, we can wonder whether other representations cannot also do the work. As I mentioned at the outset of this paper, several papers in this volume argue that the phonological representation of the accentual difference is not tonal, but rather prosodic.

The precise implementation differs from one proposal to the next, but it seems to me that they have certain aspects in common, in particular the assumption that Accent 1 has a more complex structure than Accent 2. For the sake of concreteness, let us suppose that Accent 1 involves somehow a bisyllabic structure, whereas Accent 2 is monosyllabic:

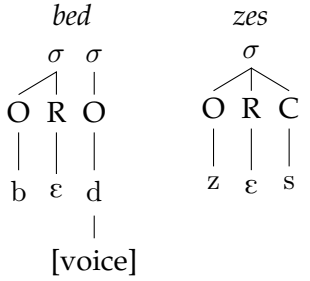
(22)



Combining these representations with the Stratal approach just outlined would mean that at the root level words ending in a voiced obstruent would have a different representation from those ending in a voiceless obstruent:

[3]Derivational synchronic accounts usually have something in common with diachronic approaches of the same data, in that they posit an irreversible order in which phenomena are supposed to occur. Translating the present account one-on-one to diachrony would imply saying that in Moresnet the accentuation occured before (any) final devoicing or assimilation. That seems rather far-fetched. This in turn means that the diachronic account cannot reach the same level of simplicity as the one proposed here.

(23) a. Accent 1 b. Accent 2



What kind of constraint could be responsible for this division? The syllabification of Accent 2 seems to make most sense: the obstruent is put in a coda, and we could assume that this follows from ordinary constraints on syllabification. So why don't stems ending in a voiced obstruent satisfy these same constraints? I propose that the reason for this is Final Devoicing: voiced obstruents should not be in a coda. At the root level of Moresnet, this problem is not solved by devoicing the obstruent but by syllabifying the obstruent in an onset (**?**, argues that also Standard French satisfies Final Devoicing in this way at the end of the word).

In this way, then, the connection between voicing and accentuation becomes a different one: a final voiced plosive causes a different accentuation since it triggers a different syllable structure. In terms of constraint-ranking, we have to add one more constraint to the set we entertained above: *EMPTY, disallowing empty-headed syllables such as the one in (**??**b). This constraint will thus be responsible for putting a consonant in a coda by default, i.e. in words ending in a voiceless consonant.[4] If we sandwich FINDEV in between IDENT and *EMPTY, we get the desired result (parentheses denote syllable boundaries):

(24) a.

bɛd	Ident-Vc	FinDev	*Empty
a. (bɛt)	*!		
b. (bɛd)		*!	
c. ☞ (bɛ)(d)			*
d. (bɛ)(t)	*!		*

b.

zɛs	Ident-Vc	FinDev	*Empty
a. ☞ (zɛs)			
b. (zɛ)(s)			*!

[4]We have to assume that the prosodic structure of (Accent 1) words ending in a long vowel or a sonorant is determined by other factors, for instance those described in the other papers in this volume.

Obviously, at the next (Word-)level, the laryngeal phonology will have to interact with these structures. The technical difficulty is that now we will want the word-final consonants to devoice after all, while leaving the accentual distinction in place. One possible way in which this might happen is that at this point the prosody is replaced by tones — but as working this out would require a rather elaborate theory of faithfulness, I will not pursue this here. Alternatively, it might be the case that now a different type of final devoicing becomes available. It has been suggested that language typology provides for two kinds of final devoicing languages (**?**): those like Dutch which devoice at the end of the syllable, and those like Yiddish, which devoice only at the end of the word. This may be taken to imply that there are two devoicing constraints and one (the 'Dutch' one) operates at the earler root level, whereas the other (the 'Yiddish' one) works at the later level. Even though the final consonant of /bɛd/ is not syllable-final, it is word-final and it will therefore devoice:

(25)

(bɛ)(d)	Faith-Prosody	FinDev-Wd	Ident-Vc
a. (bɛt)	*!		*
b. (bɛd)	*!	*	
c. ☞ (bɛ)(t)			*
d. (bɛ)(d)		*!	

Notice that it is absolutely important that this analysis is derivational and uses two levels. If we would try to mix them, the fact that the final obstruent gets devoiced would still make accentuation opaque.

Voicing assimilation is completely unproblematic under the approach advocated here, as it will not interact with accentuation at all:

(26)

(stop)(də)	Faith-Prosody	Assimilation	Ident-Vc
a. ☞ (stob)(də)			*
b. (stop)(də)		*!	

Since Assimilation does not interact, it could actually apply already at the Root level; but given that the relevant contexts are still only created by affixation, it seems that the Word level is the earliest relevant level.

Under the current assumptions, there will also some work to be done at the Postlexical level, since the intonational tones will presumably have to be assigned here. I refer again to the work of my colleagues in this volume for several ideas as to how to do it. However, it is interesting to note that it seems to be the case that the realisation of Accent 1 and Accent 2 differs under different intonational patterns, such as declarative vs. interrogative

contour (**?**, p. 154). This is seen by the other authors as a strong argument in favour of a prosodic analysis, since it is easily analysed if we assume that the tones are provided by the intonational contour.

6 Conclusion and predictions

It is always difficult to compare models. In the analysis of a seemingly rather simple phenomenon such as the allophonic alternation between Accent 1 and Accent 2 on short vowels in Moresnet, depending on the underlying voicing of the following obstruent, several different theoretical assumptions play a role and interact: the representation of the accentual distinction, that of voicing, and the issue whether or not we allow ourselves to refer to different levels of representation.

Since the space of choices is very large in particular in the domain of representations, it seems impossible to prove that a representational solution to the opacity of the accentuation rule in Moresnet is impossible: maybe the theoretical machinery is just insufficient. But I feel confident to claim that with the fairly standard toolbox which I have used here, a monostratal solution is impossible. But, surprisingly given this fact, we can change our assumptions on the representation: the original phonetic correlation between tone and voicing may have been reanalysed as an abstract response to voiced obstruents in codas.

I believe that the result presented here is of theoretical importance also for another reason. I am not aware of many examples of 'real' opacity in West-Germanic dialects in which it seems absolutely necessary to posit two (or more) representations; most of them can be representationally reanalysed. The interaction between tone and final devoicing and assimilation in Moresnet seems however truly opaque, in particular since there are *two* processes at work, which both interact independently. This can be elegantly explained in a derivational framework using two representations, but giving a monorepresentational account would involve an unknown machinery.

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