

## 1. Theoretical background

I take the following general principle as my guideline in the study of the interface between phonology and morphology:

**Morphological Recoverability.** Every morpheme in the input should be represented in the phonological output.

This principle — which basically claims that (i) morphology is additive, and (ii) morphemes tend to have a surface effect in the phonology — is to a large extent independent from the choice of formal framework. In Optimality Theory, it could be expressed by the following constraint:

- (1) EXPRESS-[F]  
 The morphological feature F should be expressed in the phonological surface.  
 (Some phonological feature connected to the input expression of F should be present in the output.)

Example I: Hellendoorn Dutch

- |  |  |
|--|--|
| (2) a. <i>werken</i> [werkŋ]<br>'(we) work'<br>c. <i>hopen</i> [hopm]<br>'(we) hope' | b. <i>werkten</i> [werkŋ]<br>'(we) worked'<br>d. <i>hoopten</i> [hopn]<br>'(we) hoped' |
|--|--|

This is seen as a consequence of EXPRESS-Tense. The phonological input of the past tense morpheme is a /t/, i.e. a feature bundle like the following:

- (3)
- $$\begin{array}{c}
 [+cons]_{tense} \\
 / \quad \backslash \\
 [-cont]_{tense} \quad [coronal]_{ense}
 \end{array}$$

The constraint says: one of the elements containing the tense-subscript should be present in the phonological output. In this case, this is the Place feature [Coronal]

Example II: Flemish

- (4)
- |   |  |
|---|--|
| a. <i>hij doe</i> /t/ /v/eel 'he does a lot'<br><i>hij doe</i> [f]eel | b. <i>ik doe</i> /v/eel 'I do a lot'<br><i>ik doe</i> [v]eel |
|---|--|

I think (Van Oostendorp 2002) that the difference between voiced and voiceless fricatives phonologically behaves like a length distinction in West-Germanic. 'Voiced' fricatives are

short, and 'voiceless' fricatives are long. If this analysis is correct, it could be the *position* of the /t/ that is retained after its disappearance:

- (5)
- |   |   |
|---|---|
| <i>underlying</i><br>hei dut vel<br> <br>[labial] | <i>surface</i><br>hei du • <sub>3SG</sub> fel<br>      <br>[labial] |
|---|---|

## 2. Tone and (adjectival/nominal) inflection in Limburg Dutch

Limburg dialects are famous in the linguistic literature for showing a lexical contrast between 'falling tone' and 'dragging tone' (these English terms as well as the Maasbracht facts and the 'standard' parts of the analysis are from Hermans 1994; facts are from Hermans 1994 and Alderete 1997):

- |   |   |
|---|---|
| <p>(6) <b>falling tone</b></p> <p>mín 'minus'</p> <p>dǽn 'fir'</p> <p>klóm 'trap'</p> <p>bíi 'bee'</p> <p>zíi 'side'</p> <p>píip 'to squeak'</p> | <p><b>dragging tone</b></p> <p>míín 'vile'</p> <p>dǽín 'then'</p> <p>klóm 'hardly'</p> <p>bíi 'with'</p> <p>zíi 'she'</p> <p>pííp 'pipe'</p> |
|---|---|

Phonologically these tones can be represented in various ways. E.g.:

- |   |   |   |  |  |   |   |  |  |     |   |  |       |   |  |  |   |   |  |  |     |   |
|---|---|---|--|--|---|---|--|--|-----|---|--|-------|---|--|--|---|---|--|--|-----|---|
| <p>(7) <b>falling tone</b></p> <table style="margin-left: auto; margin-right: auto; border: none;"> <tr> <td style="text-align: center;">H</td> <td style="text-align: center;">L</td> </tr> <tr> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> <tr> <td style="text-align: center;">□</td> <td style="text-align: center;">□</td> </tr> <tr> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> <tr> <td style="text-align: center;">m í</td> <td style="text-align: center;">n</td> </tr> </table> | H | L |  |  | □ | □ |  |  | m í | n | <p><b>dragging tone</b></p> <table style="margin-left: auto; margin-right: auto; border: none;"> <tr> <td style="text-align: center;">H (L)</td> <td style="text-align: center;">H</td> </tr> <tr> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> <tr> <td style="text-align: center;">□</td> <td style="text-align: center;">□</td> </tr> <tr> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> <tr> <td style="text-align: center;">m í</td> <td style="text-align: center;">ń</td> </tr> </table> | H (L) | H |  |  | □ | □ |  |  | m í | ń |
| H   | L |   |  |  |   |   |  |  |     |   |  |       |   |  |  |   |   |  |  |     |   |
|   |   |   |  |  |   |   |  |  |     |   |  |       |   |  |  |   |   |  |  |     |   |
| □   | □ |   |  |  |   |   |  |  |     |   |  |       |   |  |  |   |   |  |  |     |   |
|   |   |   |  |  |   |   |  |  |     |   |  |       |   |  |  |   |   |  |  |     |   |
| m í   | n |   |  |  |   |   |  |  |     |   |  |       |   |  |  |   |   |  |  |     |   |
| H (L)   | H |   |  |  |   |   |  |  |     |   |  |       |   |  |  |   |   |  |  |     |   |
|   |   |   |  |  |   |   |  |  |     |   |  |       |   |  |  |   |   |  |  |     |   |
| □   | □ |   |  |  |   |   |  |  |     |   |  |       |   |  |  |   |   |  |  |     |   |
|   |   |   |  |  |   |   |  |  |     |   |  |       |   |  |  |   |   |  |  |     |   |
| m í   | ń |   |  |  |   |   |  |  |     |   |  |       |   |  |  |   |   |  |  |     |   |

In the transcriptions, a high tone is noted by an accent: [á] and a low tone by lack thereof: [a].

Note that there are quite a few redundancies in these representations:

1. Phonetically, it is usually assumed, that the L tone in the dragging tone is the result of some postlexical or phonetic effect (OCP).
2. The first mora of the syllable always contains a high tone; we may assume that this is a 'pitch accent', not a lexical tone.
3. The topic of debate thus is the final tone: which of these two is 'marked' and underlyingly present: the low tone or the high tone?

The difference between dragging tone and falling tone can also be used in inflection. As a matter of fact the most widespread alternations are probably those between singular and plural nouns:

(8) [béin] 'leg' - [béin] 'legs'.

There are more inflectional suffixes that induce a change from a dragging tone into a falling tone.

(9)	<b>neuter</b>	<b>masculine</b>	<b>feminine</b>	<b>comparative</b>
a.	wíis 'wise'	wíizə	wíis	wíizər
	stíif 'stiff'	stíivə	stíif	stíivər
	γríis 'grey'	γríizə	γríis	γríizər
	dóuf 'deaf'	dóuvə	dóuf	dóuvər
	γrósóf 'coarse'	γrósovə	γrósóf	γrósovər
	ʃéif 'oblique'	ʃéivə	ʃéif	ʃéivər
	káál 'bald'	káalə	káal	káalər
	γéél 'yellow'	γéelə	γéel	γéelər
	brúún 'brown'	brúunə	brúun	brúunər
	fíin 'refined'	fíinə	fíin	fíinər
	láám 'lame'	láamə	láam	láamər
	táám 'tame'	táamə	táam	táamər
b.	(examples káalm 'calm'	with káalmə	falling káalm	tone) káalmər
c.	wéés 'pig-headed'	wéésə	wéésə	wéésər
	ríik 'rich'	ríikə	ríikə	ríikər
	nááks 'naked'	nááksə	nááksə	nááksər
	záát 'drunk'	záátə	záátə	záátər
	zóót 'salted'	zóótə	zóótə	zóótər
	bléík 'pale'	bléíkə	bléíkə	bléíkər

Questions:

1. What is the difference between neuter and the other forms (in particular, feminine)?
2. How does the change in tone express the feminine? What is the phonological feature that expresses feminine?
3. Why does this difference only affect 'dragging' tone?  
Why are there no suffixes which change a falling tone into a dragging tone (see section \* on verbal inflection)
4. Why is there no difference if the stem ends in an underlyingly voiceless obstruent?

### 3. Tones expressing morphological features

For the sake of concreteness, I concentrate on the feminine form of the adjective, but a very similar analysis could be given for all other forms of inflection (we just need to specify which suffixes have an underlying tone and which ones do not).

I assume that the feminine and masculine suffix have the following phonological specification:

$$(10) \quad \begin{array}{cc} [-\text{cons}]_{\text{feminine}} & [-\text{cons}]_{\text{masculine}} \\ & | \\ [L]_{\text{feminine}} & [L]_{\text{masculine}} \end{array}$$

This is a schwa (an empty vowel) with an underlying Low tone. We assume that the difference between the feminine and the masculine suffix is that in the latter vowel and tone are linked; this prevents deletion of schwa.

There are several reasons for assuming that L(ow) tone, rather than H(igh) tone is the marked, underlying, tone:

- Dragging tones behave as unmarked as compared to falling tones in various ways. Notice for instance that if we have a minimal pair in (6) and one of the two words is a function word (typically the type of word which does not sustain heavy phonological contrast), this is always the one with dragging tone.
- There is a strong connection between tone and voice in Limburg Dutch, which can either be expressed as (Hermans & Van Oostendorp 2000):

$$(11) \quad \begin{array}{ll} \text{(i)} & [-\text{voice}] \quad H \\ \text{(ii)} & L \quad [+ \text{voice}] \end{array}$$

Since the status of [-voice] is questionable, and for a number of other reasons Hermans & Van Oostendorp (2000) choose (ii). But this implies that L is needed in the formulation of phonological constraints (rather than H).

We could now conclude that neuter = morphologically unmarked, i.e. there are no Neuter features which need to be expressed morphologically. Obviously, this is too simplistic, as we know from Barbiers 1990 and Hinskens 1994.

I therefore assume that the neuter morpheme simply has no phonological specification. It is a phonologically completely empty morpheme. This is my answer to question 1.

As to question 2, it obviously is the Low tone. Take the representations of *wies* for neuter and feminine respectively:

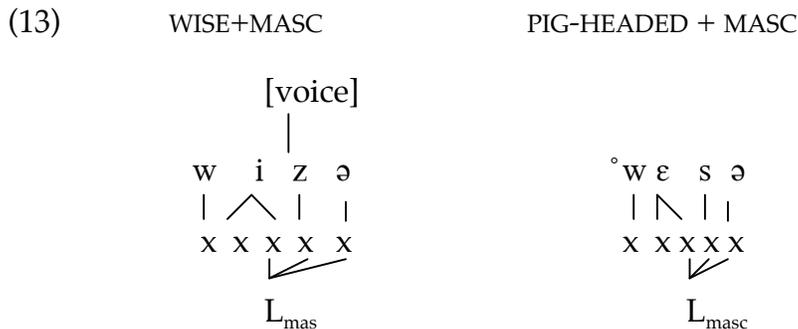
$$(12) \quad \begin{array}{cc} \text{WISE} + \text{neuter} & \text{WISE} + \text{feminine} \\ \\ \begin{array}{ccc} w & i & s \\ | & \wedge & | \\ x & x & x \end{array} & \begin{array}{ccc} w & i & s \\ | & \searrow & | \\ x & x & x \\ & | & \\ & L_{\text{fem}} & \end{array} \end{array}$$

Note that the neuter form violates EXPRESS-Gender. Within OT this is no problem, since there is no phonological material which could possibly express the neuter suffix, so this candidate will still come out as the optimal one.

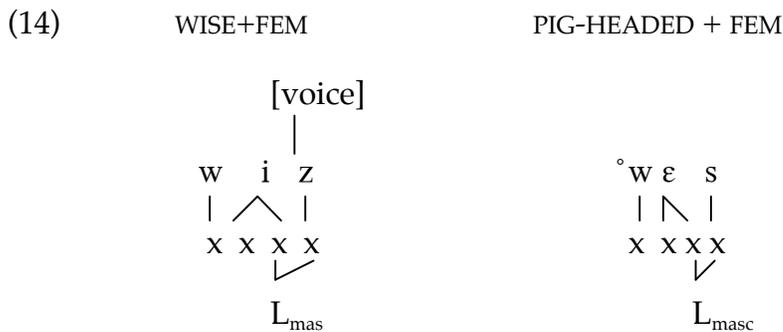
The answer to question 2 thus is: a low tone. Notice that feminine could in principle also be expressed as a schwa vowel. For some (partly phonological) reasons, this does not happen after a voiced obstruent or a sonorant: this schwa is deleted in that context. The answer to question 3 seems also straightforward: there can be no suffixes changing falling tone into dragging tone, since this would involve lexical high tones, but these are not present by the reasoning outlined above.

#### 4. Voiceless consonants in the feminine

Why do stems in underlyingly voiceless consonants block the tone shift? This is related to the constraint in (11) (which by the way was proposed independently of these facts). Suppose that the Low tone, being part of a suffix has to be linked to the rightmost edge of the word. Now compare the following two (masculine) forms:



The /z/ obviously satisfies L [+voice], but voiceless /s/ is not linked to [voice], so that it violates this constraint. How about the feminine forms? We now have to assume the following:



This obviously does not conform to the phonetic reality, since Limburg has Final Devoicing. We need to assume than (i) that Final Devoicing is a postlexical process and (ii) that either L [+voice], or (slightly more attractively) the constraint forcing the low tone to be right aligned no longer holds postlexically.

## 5. OT Tableaux

Constraints:

1. L [+voice]: If a segment (consonant) is linked to a Low tone, it should be linked to [voice]
2. EXPRESS-[Gender]: The morphological gender feature should be expressed in the phonological surface.
3. CONNECT(H,Ft'): A High tone should be linked to the head mora of the primary stressed foot and vice versa. (Projection constraints are formalised in Van Oostendorp 1995, 2000)
4. ALIGN-SUFFIX: Suffixes should be right aligned with the word.
5. PROJECT(□,V): Syllable heads should have vocalic quality (\*SCHWA')
6. FA (FAITHFULASSOCIATION): Respect underlying association lines; respect underlying tones.
7. PROJECT(Ft',T): Mora's in the stressed foot should have some tone.

1. Simple form: dragging tone.

min	L [vc]	EXPRESS	CONNECT	ALIGN	PROJECT(Ft')	FA	*SCHWA
min			*!		*		
HL     min						**!	
H ↘ min						*	
L   min			*!		*		

2. Simple form: falling tone.

L min	L [vc]	EXPRESS	CONNECT	ALIGN	PROJECT(Ft')	FA	*SCHWA
min			*!		*		
HL     min						***	
L H     min			*!				
L ↘ min			*!				
H ↘ min						****!	
L   min			*!		*		

3. Masculine form of adjective (underlying dragging tone+vd consonant)

	L [vc]	EXPRESS	CONNECT	ALIGN	PROJECT(FT')	FA	*SCHWA
L   wiiz+ə							
L   wiizə			*!		*		*
HL /   w i i z ə					*!	***	*
H L   / w i i z ə						*****	*
L / / / w i i z ə			*!				*
H / / w i i z ə				(*)		*****!	*
HL   / wiizə				*!			*
HL   / wiiz						***** !	
H - / / wiiz		*!		(*)			
HL /   wiiz					*!		

We assume that there are no gaps in spreading: the only reason why sometimes the L tone is not linked to an intermediate consonant in these pictures, is because this link is irrelevant in the case at hand, and would make the picture too complicated.

4. Masculine form of adjective (underlying dragging tone+vless consonant)

L   wεεs+ə	L [vc]	EXPRESS	CONNECT	ALIGN	PROJECT(FT')	FA	*SCHWA
L   wεεsə			*!		*		*
H L /   w ε ε s ə					*!	***	*
H L   / w ε ε s ə	*!					*****	*
L / / w ε ε s ə	*!		*				*
H - /   w ε ε s ə						*****!	*
H L   / wεεsə				*!			*
H L   / w ε ε s	*!					*****	
H - ∩ w ε ε s		*!		(*)			
H L ∩   w ε ε s	*!				*!		

5. Feminine form of adjective (underlying dragging tone+vd consonant)

L wiiz+ə	L [vc]	EXPRESS	CONNECT	ALIGN	PROJECT(FT')	FA	*SCHWA
L   wiizə			*!		*		*
HL /   wiizə					*!	***	*
H L   / wiizə						*****	*
L / / wiizə			*!				*
H w / wiizə				(*)		*****!	*
HL   / wiizə				*!			*
HL   / wiiz						***** !	
H - N wiiz		*!		(*)			
HL N   wiiz					*!		

We assume that there are no gaps in spreading: the only reason why sometimes the L tone is not linked to an intermediate consonant in these pictures, is because this link is irrelevant in the case at hand, and would make the picture too complicated.

4. Masculine form of adjective (underlying dragging tone+vless consonant)

L wɛɛs+ə	L [vc]	EXPRESS	CONNECT	ALIGN	PROJECT(FT')	FA	*SCHWA
L   wɛɛsə			*!		*		*
H L /   w ɛ ɛ s ə					*!	***	*
H L   / w ɛ ɛ s ə	*!					*****	*
L / / w ɛ ɛ s ə	*!		*				*
H - /   w ɛ ɛ s ə						*****!	*
H L   / wɛɛsə				*!			*
H L   / w ɛ ɛ s	*!					*****	
H - ∩ w ɛ ɛ s		*!		(*)			
H L ∩   w ɛ ɛ s	*!				*!		