

# Transparent Morphology Causes Phonological Opacity

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# Goal

- ▶ Show how the wish to mirror morphological structure in the phonology may make phonological processes sometimes look opaque, based on data from a Dutch dialect (Hellendoorn).

## Transparent Morphology - Phonological Opacity

### A monostratal model of faithfulness

Interface with morphology

Containment

### Nasal assimilation

Nasal assimilation

Morphological mirroring

### Vowel nasalisation

Vowel nasalisation

Detour: 'Complete assimilation'

### Conclusions

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## The morphological mirroring hypothesis

- ▶ One ‘function’ of phonological structure is to express morphological structure.
- ▶ We thus build on a theory where morphology as well as phonology have structure.
- ▶ This has several consequences:
  - ▶ ‘Alignment’: edges of phonological constituents correspond to edges of morphological constituents
  - ▶ Head reflection: morphological heads should be expressed by phonological heads
  - ▶ ‘Realize-Morpheme’: every morpheme has to be expressed at least minimally in the phonology

## The morphological mirroring hypothesis

- ▶ Application of phonological operations may obscure the underlying form and the morphological structure of words
- ▶ If features freely spread, it may become hard to distinguish between morphemes, or to find the boundaries of morphological constituents
- ▶ If there are mirroring constraints, these may ‘illogically’ block the purely phonological constraints
- ▶ Apparently opaque phonological behaviour may therefore follow from the drive to mirror morphological structure faithfully in the phonology.



## REALIZE-MORPHEME

- ▶ Various proposals to this effect (e.g. Itô and Mester 2002, Kurisu 2001)
- ▶ They are not always very restrictive (e.g. allowing subtractive morphology)
- ▶ Our version:
  - ▶ Every morpheme should be represented in the phonological structure.



## Consistency of Exponence

No changes in the exponence of a phonologically-specified morpheme are permitted.

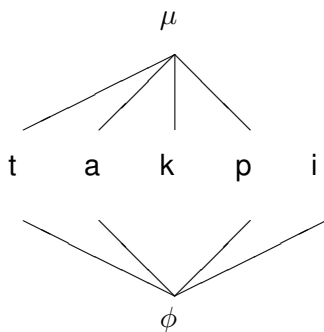
(McCarthy & Prince 1993ab)

## Consistency of Exponence

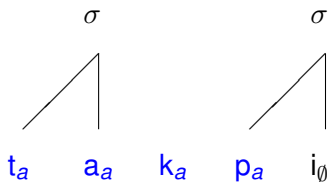
“[CoE] means that the lexical specifications of a morpheme (segments, prosody, or whatever) can never be affected by Gen. In particular, epenthetic elements posited by Gen will have no morphological affiliation, even when they lie within or between strings with morphemic identity. Similarly, underparsing of segments — failure to endow them with syllable structure — will not change the make-up of a morpheme, though it will surely change how that morpheme is realized phonetically. Thus, any given morpheme’s phonological exponents must be identical in underlying and surface form.”

# Picturing Consistency of Exponence

/takp/ → [tapi]



# Picturing morphological colours





# Containment

No element may be literally removed from the input form. The input is thus contained in every candidate form.

# The Parse and Fill Model

(Prince and Smolensky 1993)

1. PARSE: Deleted elements are ‘not parsed’ in the phonological structure
2. FILL: Inserted segments are ‘empty’

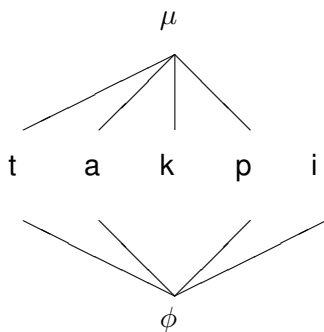
## Problems with the P & F Model

The problems with P&F are mainly with the Fill component:

- ▶ It falsely predicts that epenthetic segments are empty, and cannot be the target of vowel harmony, assimilation, etc.
- ▶ It does not have any theory about insertion of features.

# Picturing Consistency of Exponence

/takp/ → [tapi]



## Coloured Containment

- ▶  $\text{PARSE-}\phi(\alpha)$ : The morphological element  $\alpha$  must be incorporated into the phonological structure. (No deletion.)
- ▶  $\text{PARSE-}\mu(\alpha)$ : The phonological element  $\alpha$  must be incorporated into the morphological structure. (No insertion.)

# Opacity

- ▶ Every Correspondence-based account of Opacity further extended the power of the theory, and thus is no proof that we need the original power
- ▶ CC gives an enriched phonological representation; in particular, morphology is visible present, blocking or triggering processes



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## Nasal assimilation

- ▶ Hellendoorn Dutch has been claimed to have two processes of nasal assimilation:
  - ▶ Progressive: /stɔp+(ə)n/ 'stop'+INF → [stɔpɱ]
  - ▶ Regressive: /(ə)n+bom/ 'a tree' → [ɱbom]
- ▶ Both processes are opaque:
  - ▶ Progressive: /stɔp+(ə)n/ 'stop'+PAST+PL → [stɔpɱ]
  - ▶ Regressive: /d(ə)n+bom/ 'the tree' → [ɱbom]

(Nijen Twilhaar 1990)

## Directionality of nasal assimilation

- ▶ Is it necessary to distinguish between two types of nasal assimilation?
- ▶ Note that both involve only nasals in the syllable rhyme (such as syllabic nasals)



k[n]ärre      ‘old crone’

Bruck[n]er

ramp[n]acht      ‘night of disaster’ (*ramp* ‘disaster’ + *nacht* ‘night’)

haek[n]oale      ‘crochet hook’ (*haek* ‘crochet’ + *noale* ‘hook’)

loop [n]ie      ‘don’t walk’ (*loop* ‘walk’ + *nie* ‘not’)

wärk [n]ie      ‘don’t work’ (*wärk* ‘work’ + *nie* ‘not’)

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## Directionality of nasal assimilation (2)

- ▶ When a syllabic nasal occurs between two obstruents, the direction of assimilation is construction-specific:
  - ▶ Progressive over regressive:
 

*lop+ən können* ‘walk’ + INF + can → *lop[m] können* (\**lop[ŋ] können*)
  - ▶ Regressive over progressive:
 

*lop+ən keer* ‘walk’ + a + time → *lop[ŋ] keer* (\**lop[m] keer*)

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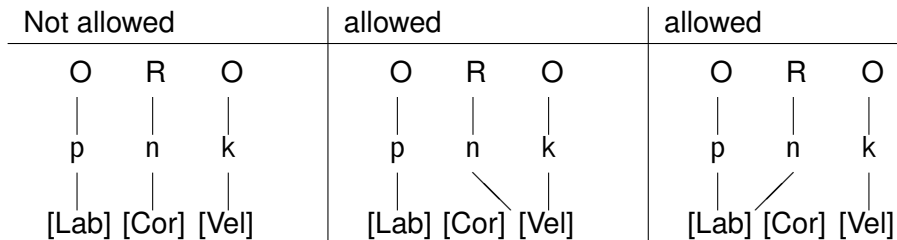
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## The phonology of nasal assimilation

- ▶ We propose that progressive and regressive assimilation are not distinct processes, but two ways of resolving the same constraint violation:
- ▶ \*RHYME/CONSONANT: Consonantal place features should be linked to some position outside the syllable rhyme.

(Itô 1986)

## The phonology of nasal assimilation



- ▶ There are several questions related to this constraint (why does this affect nasals? why should the place feature originate from outside the rhyme?) which we will leave unresolved

# Morphological mirroring

- ▶ Two subtypes of morphological mirroring are involved
  - ▶ 'Alignment': edges of phonological constituents correspond to edges of morphological constituents
  - ▶ 'Realize-Morpheme': every morpheme has to be expressed at least minimally in the phonology

# Alignment

- ▶ The difference between the two structures is morphosyntactic:
- ▶ Progressive over regressive:  
*lop+ən können* ‘walk’ + INF + can  
[<sub>VP</sub> [<sub>V</sub> loop n] [<sub>V</sub> können]]
- ▶ Regressive over progressive:  
*lop ən keer* ‘walk’ + a + time  
[<sub>VP</sub>loop [<sub>DP</sub>n keer]]

# Alignment

- ▶ **ALIGN (CRISP):** If segment  $\alpha$  and feature  $\beta$  are associated, they should be in the same morphosyntactic constituent. (Do not cross association lines).
- ▶ The more syntactic boundaries are crossed, the more severe the violations.
- ▶ No rule ordering of Progressive Assimilation over Regressive Assimilation (or constraint ranking at different levels of postlexical phonology) is necessary.
- ▶ Phonology mirrors morphology.

(Itô and Mester 1996)

## REALIZE-MORPHEME

- ▶ Explains the ‘opacity effect’
- ▶ Progressive: /stɔp+(ə)n/ ‘stop’+INF → [stɔpɪŋ]
- ▶ input: *stop*, *-t-*, *-en*

O     R

|     |  
p     n

- ▶ [Lab] [Cor]
- ▶ Violates \*RHYME/CONSONANT, but satisfies REALIZE-MORPHEME



## Vowel nasalisation

singular	plural	
r[i]	r[ĩ]	'deer(s)'
spr[ø]	spr[ø̃]	'starling(s)'
vl[ø]	vl[ø̃]	'flea(s)'
b[õ]	b[ɔ̃n̩]	'bill(s)'
m[ã]	m[an̩]	'man/men'
l[õ]	l[on̩]	'wage(s)'

- ▶ Generalisation: Words do not end in a [Vn] cluster, except if they are the plural of a noun ending in a nasal vowel in the singular.

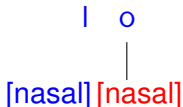
## Analysis: the simple cases

- ▶ Disallowance of [Vn] can be attributed to \*RHYME/CONSONANT
- ▶ Hypothetic monomorphemic underlying /bɔn/ will surface as [bɔ̃]
- ▶ Polymorphemic /sprø/ + /-(ə)n/ will surface as [sprø̃]
- ▶ The nasal feature will serve to satisfy REALIZE-MORPHEME

s p r ø  
 |  
 [nasal]

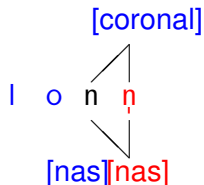
## Analysis: the complex case

- ▶ For some reason, nasal vowels cannot be adjacent to nasal consonants (independent of this fact): \*NN
- ▶ This case is ‘opaque’ in the sense that it is not clear why addition of a nasal feature to a nasal vowel could not lead to the following structure:



## Analysis: the complex case

- ▶ However, in this case, there is a more faithful solution to the problem, parsing *all* features.



This satisfies NN, REALIZE-MORPHEME, \*RHYME/CONSONANT, as well as (almost) all other faithfulness constraints.



## 'Complete assimilation'

- ▶ Why do we assume that [nasal] has spread in *lonŋ*?
- ▶ Because there is independent evidence for this spreading if the stem ends in a voiced obstruent:

bi[nŋ]	'to pray' (from /bid/)
schro[mŋ]	'to scrub' (from /sxrob/)
loo[mŋ]	'to praise' (from /lo:v/)
ze[ŋŋ]	'to say' (from /zεʏ/)

# Assimilation of nasality

- ▶ Nasal assimilation is in fact spreading of [nasal]
- ▶ We can observe this in the opaque past tense:
  - [lɛŋŋ] 'lay'
  - [lɛŋŋ̃] 'layed'

Detour: 'Complete assimilation'

## Nasal sequences

- ▶ All of this can lead to nasal sequences such as:
- ▶ op de wèè[ŋŋ ŋ n]acht snee  
“on the roads the snow of one night”

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- ▶ The opaque behaviour of nasals and nasal assimilation in Hellendoorn Dutch follows from the interaction of phonology with morphological structure
- ▶ In particular, many facts follow from the interaction of a constraint against consonantal features in coda with constraints on morpheme expression
- ▶ Because morphological structure needs to be expressed, it may make the phonological structure opaque