# Allomorphy as optimization of perceptual salience: The Swedish definite suffix /n/*

Ingvar Löfstedt
University of California, Los Angeles

## 1. Introduction

The Swedish non-neuter definite article has two allomorphs, [n] and [en]. Langacker's (1968) influential analysis of English allomorphy boils distribution down to stem phonotactics. I will review the distribution of the allomorphs of the Swedish non-neuter definite article, and then show that the distribution of these allomorphs cannot be reduced to stem phonotactics. I will argue that it is driven by perceptual salience, and it is generated by constraint rankings projected from the P-map (Steriade 2001). I will also show that minimality, sonority sequencing, and blocking of potential neutralization fail to account for the pattern.

## 2. Distribution of allomorphs

Consider the distribution of the allomorphs. After vowels, the allomorph [n] surfaces:

(1)

| SG. = STEM | * | NON-N. SG. DEF. | GLOSS |
|---|---|---|---|
| [byː] | *[ˈbyː**en**] | [ˈbyː**n**] | 'village' |
| [frʉː] | *[ˈfrʉː**en**] | [ˈfrʉː**n**] | 'wife' |
| [bruː] | *[ˈbruː**en**] | [ˈbruː**n**] | 'bridge' |

The preference of [n] over [en] postvocalically is not motivated by phonotactics. The neuter singular definite article has the allomorphs [t] and [et]. In standard Swedish, the allomorph [et], not [t][1] surfaces after stressed vowels:

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[1] Teleman lists the ‘e’ in parenthesis in these forms; in nonstandard dialects, this /e/ can be dropped.  In standard Swedish, however, this /e/ is not dropped before the neuter article. For example, the definitive wordlist of Swedish SAOL does not list the /t/ allomorph for these items.  In short, the licensing of neuter /t/ is not accepted in all dialects that license non-neuter /n/.

| (2) | SG. = STEM | * | N. SG. DEF. | GLOSS |
|---|---|---|---|---|
| | [blyː] | *[blyːt] | [ˈblyːet] | ‘lead’ |
| | [kʉː] | *[kʉːt] | [ˈkʉːet] | ‘letter Q’ |
| | [buː] | *[buːt] | [ˈbuːet] | ‘nest’ |

The UR /n/ is also suggested by lateral-final trochee stems:[2]

| (3) | SG. = STEM | * | NON-N. SG. DEF. | GLOSS |
|---|---|---|---|---|
| | [ˈkonsʉl] | *[ˈkonsʉl**en**] | [ˈkonsʉl**n**] | ‘consul’ |
| | [ˈnykːel] | *[ˈnykːel**en**] | [ˈnykːel**n**] | ‘key’ |

I therefore depart from previous accounts (Teleman 1969, Eliasson 1972, Hellberg 1974) which have assumed /en/ as the underlying representation, in addition to morpheme-specific syncope rules. I will assume that /n/ is the UR.

Unsurprisingly, epenthesis applies after stem-final obstruents.

| (4) | SG. = STEM | NON-N. SG. DEF. | * | GLOSS |
|---|---|---|---|---|
| | [gruːp] | [ˈgruːp**en**] | *[ˈgruːp**n**] | ‘hole’ |
| | [iːs] | [ˈiːs**en**] | *[ˈiːs**n**] | ‘ice’ |

This is banal, since the clusters obstruent-n would be phonotactically deviant in Swedish.

More interestingly, the allomorph [en] appears after a stem-final nasal, whether that nasal is short or long.

| (5) | SG. = STEM | NON-N. SG. DEF. | * | GLOSS |
|---|---|---|---|---|
| | [krɛːm] | [ˈkrɛːm**en**] | *[krɛːm**n**] | ‘cream’ |
| | [rɑːm] | [ˈrɑːm**en**] | *[rɑːm**n**] | ‘frame’ |
| | [remː] | [remː**en**] | *[rem**n**][3] | ‘strap’ |
| | [strømː] | [ˈstrømː**en**] | *[strøm**n**] | ‘current’ |
| | [riŋː] | [ˈriŋː**en**] | *[riŋ**n**] | ‘ring’ |

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2 Two exceptions are [ˈhimːel] ‘heaven’, which surfaces as [ˈhimːel**n**], [ˈhimː**len**] or [ˈhimːel**en**]; and [ˈfjɛːril] ‘butterfly’ which surfaces as [ˈfjɛːril**en**].

3 Long consonants are shortened in preconsonantal position. See Kloster Jensen (1962).

This is no minimality effect: epenthesis applies to polysyllabic nasal-final forms, independent of their stress or morphological structure.

(6)

| SG. = STEM | NON-N. SG. DEF. | * | GLOSS |
|---|---|---|---|
| [ˈpilgrim] | [ˈpilgrim**en**] | *[ˈpilgrim**n**] | ‘pilgrim’ |
| [koˈsty:m] | [koˈsty:m**en**] | *[koˈsty:m**n**] | ‘outfit’ |
| [ˈvɛl:iŋ] | [ˈvɛl:iŋ**en**] | *[ˈvɛl:iŋ**n**] | ‘porridge’ |
| [ʉŋ: + dum:] | [ʉŋ:dum:**en**] | *[ʉŋ:dum**n**] | ‘young’ + ‘n.-frm.’ = ‘youth’ |
| [older + dum:] | [olderdum:**en**] | *[olderdum**n**] | ‘age’ + ‘n.-frm.’ = ‘old age’ |
| [ɛlsk + liŋ] | [ɛlsk + liŋ**en**] | *[ɛlsk + liŋ**n**] | ‘love’ + ‘dim.’ = ‘darling’ |
| [rɛd: + niŋ] | [rɛd: + niŋ**en**] | *[rɛd: + niŋ**n**] | ‘save’ + ‘n.form.’ = ‘rescue’ |

This is not due to stem phonotactics: [mn] and [ŋn] are licit codas in Swedish monomorphemes:

(7)

| STEM = SG. | GLOSS |
|---|---|
| [hymn] | ‘hymn’ |
| [jɛmn] | ‘even’ |
| [hamn] | ‘harbor’ |
| [dyŋn] | ‘24 hours’ |
| [hɛŋn] | ‘protection’ |
| [vaŋn] | ‘wagon’ |

The following minimal pairs contrast the grammaticality of tautomorphemic word-final [mn] and [ŋn] with the ungrammaticality of heteromorphemic [m + n] and [ŋ + n]:

(8)

| | | | | |
|---|---|---|---|---|
| monomorpheme | [sømn] | | | ‘sleep’ |
| but: | [søm:] | → | [ˈsøm:en] *[sømn] | ‘the seam’ |
| monomorpheme | [sɛŋn] | | | ‘legend’ |
| but: | [sɛŋ:] | → | [ˈsɛŋ:en] *[sɛŋn] | ‘the bed’ |

In stems ending in [l] that are stressed on the final syllable, the allomorph [en] is the correct form of the definite article. This applies to monosyllabic stems, polysyllabic stems, and both singleton and geminate [l]:

(9)

| STEM | INCORRECT | NON-N. SG. DEF. | GLOSS |
|---|---|---|---|
| [vɑːl] | *[vɑːl**n**] | [ˈvɑː**len**] | 'whale' |
| [korˈprɑːl] | *[korˈprɑːl**n**] | [korˈprɑː**len**] | 'corporal' |
| [valː] | *[valː**n**] | [ˈvalː**en**] | 'rampart' |
| [meˈtalː] | *[meˈtal**n**] | [meˈtalː**en**] | 'metal' |

Just as epenthesis after nasal-final stems is independent of stem phonotactics, the epenthesis after lateral-final stems is independent of stem phonotactics. Lateral-n clusters are non-deviant in monomorphemes, as the following lexical item illustrates:

(10)

| STEM = SG. | GLOSS |
|---|---|
| [moːln] | 'cloud' |

The following minimal pair shows conclusively that stem phonotactics cannot capture the allomorphic pattern at hand:

(11)

| | | | | | |
|---|---|---|---|---|---|
| monomorpheme | | [ɑːln] | | | 'el' |
| | but: | [ɑːl] | → | [ɑːlen] | 'the alder' |
| | | | | *[ɑːln] | |

We have seen, then, that the pattern of [e]-epenthesis before the /n/ non-neuter definite morpheme is not driven by stem phonotactics.

## 3. Perceptually driven allomorphy

Epenthesis of [e] before the article /n/ after sonorants [l m ŋ] is driven by perceptual salience. Since /n/ carries the functional load of morpheme, it is under stricter perceptibility requirements than non-morphemic /n/. The epenthesis of [e] optimizes the distinction between the definite member of the noun's paradigm from the (unaffixed) non-definite stem.

Kiparsky (1982, 87) notes the functional nature of paradigmatic distinctness:

> [V]arious types of regularities in phonology and morphology ... are based on general conditions of a *functional* nature. [...] We have... *distinctness conditions,* which...state that there is a tendency for semantically relevant information to be retained in surface structure.

Intraparadigmatic homophony is an example of where non-distinctness is violated. Crosswhite 1999 formalizes the constraint ANTI-IDENTITY to rule out this state of affairs:

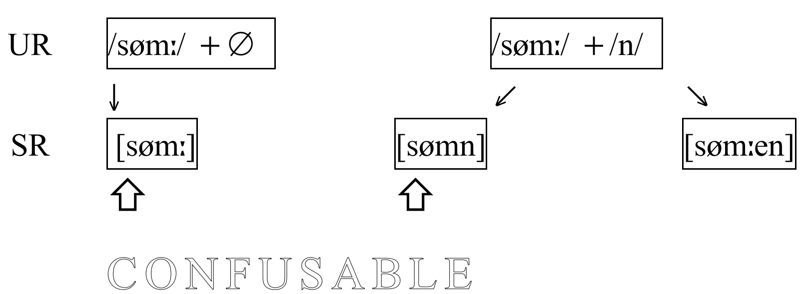
(12) For two forms, $S_1$ and $S_2$, where $S_1 \neq S_2$ , $\exists\alpha$, $\alpha \in S_1$ , such that $\alpha \neq R(\alpha)$

Informally, this constraint states that two tautoparadigmatic forms $S_1$ and $S_2$ must be segmentally non-identical. If two tautoparadigmatic forms are homophonous, ambiguity is introduced to the system, such that semantic distinctness is not captured in the phonology. Semantic information is not being retained in an optimal fashion; in this sense, distinctness is violated.

I will borrow Kiparsky's and Crosswhite's plausible intuition regarding the functional significance of paradigmatic distinctiveness. However, I will formalize it in a gradient—not categorical—fashion. For morphophonological exponence to be functionally effective, it must be relatively salient. From a functional perspective, we should expect different members of a paradigm to not only be phonologically distinct; they should be perceptually distinct to a non-trivial degree. An overly subtle perceptually distinction would be functionally worthless.

Take the Swedish stem /søm:/ 'seam'. The non-definite form has a null suffix, so it surfaces as [søm:]. The definite form might surface with either [n] or [en], featuring the epenthetic [e]. While the former is phonetically distinct from the non-definite form, they are nevertheless somewhat confusable.

(13)



I claim that the mechanism that chooses the allomorph with epenthetic [e] is the mechanism that minimizes confusability within a single stem's paradigm.

Even the most robust phonetic distinction—say [s] versus [a]—can be rendered imperceptible in a sufficiently noisy ambiance: a given morphemic exponence inevitably features some level of perceptual fragility. So, I posit *NONDIST MORPH as a family of constraints, where any sound/context combination incurs a violation, since any sound/context combination is, to some degree, perceptually fragile:

(14) ***NONDIST MORPH—a family of constraints**
For two tautoparadigmatic morphemes $M_i$ and $M_j$ , with respective phonetic exponence $m_i$ and $m_j$ , then exponence $m_i$ at context K incurs a violation *NONDIST MORPH ($m_i$,$m_j$ / K).

Then, following Steriade 2001, the relative fragility of a morpheme in various contexts is projected from the P-map to the OT tableau. The ranking of the various *NONDIST MORPH constraints depends on the relative confusability of the morphemic exponence with other tautoparadigmatic exponences.

(15) **P-map-to-ranking projection of *NONDIST MORPH**
For two contexts $K_a$ and $K_b$,
and two tautoparadigmatic morphemic exponences $m_i$ and $m_j$ ,
If $\Delta\ (m_i,m_j)\ /K_a \quad < \quad \Delta\ (m_i,m_j)\ /\ K_b$ ,
then *NONDIST MORPH ($m_i$,$m_j$ / $K_a$) $\gg$ *NONDIST MORPH ($m_i$,$m_j$ / $K_b$).

Consider vowel-final stems and m-final stems as illustrations. First, we will consider the influence of the post-vocalic and post-nasal contexts on the perceptual distinctiveness of the morpheme /n/. Then we will see how this generates a P-map representation, which in turn generates an ranking of OT constraints, which is part of the Swedish grammar.

## 4. Cues for [n]

Three kinds of information must be retrieved for the perception of the segment /n/ to be salient. The listener must retrieve (a) the segmental status of the gesture. (b) the coronal place of articulation, (c) the nasal manner of articulation, and Wright 2004 and Raphael 2007 provide overviews of perceptual cues of various sounds, including [n].

To identify segmental status of the gesture, the key is signal modulation, according to Kawasaki 1982 and Ohala 1992. Wright (2004, 47) summarizes their proposal, which is

> based on the assumption that change (modulation) along an acoustic dimension, such as frequency or amplitude, will result in increased salience of the cues in the portion of the signal where the change occurs. Therefore, the greater the modulation and the more dimensions that are involved, the better the segmental organisation.

Segmental clusters that provide redundant cues are more robustly encoded than those with fragile cues. The converse also holds (Wright 2004, 48):

> [S]equences with a similar degree of aperture (stop + stop, fricative + fricative, nasal + nasal etc.) result in a poor encoding both because they result in very little perceptual benefit from overlap, and because they result in little signal modulation.

Those clusters which are massively non-optimal due to a lack of signal modulation will then be perceptually fragile.

Place cues, according to Wright (2004, 37) 'are found in the brief transitional period between a consonant and an adjacent segment....' The crucial information is in the second and third formant, which 'provide the listener with cues to the place of articulation of consonants with oral constrictions....' While the nasal pole-zero pattern includes some information about place, listeners 'identify the place of articulation more reliably from formant transitions than the nasal portion of the signal; therefore the F2 transition is considered the more powerful cue' (Wright 2004, 38, citing Malécot 1956). Raphael (2007,196) similarly notes that

> although each nasal [stop] has a distinctive spectrum, the acoustic properties varying with nasal place contrasts are not particularly prominent. This fact, coupled with similarity of the (relatively highly damped) nasal murmur for all the sounds makes it difficult for listeneres to distinguish among them.. Listeners must therefore rely on the formant transitions into and out of the nasal articulation to aid in identification....

In short, a V-C transition optimizes identification of coronal place in a sound such as [n].

As far as manner is concerned, nasalization is cued by '[a] less severe drop in amplitude [compared to fricatives or stops] accompanied by nasal murmur and a nasal pole and zero' (Wright 2004, 39; citing Hawkins & Stevens 1985). Some information preceding the actual murmur is helpful, too: '[n]asalisation of the preceding vowel (weakening of the higher formants, broadening of formant bandwidths, and the introduction of a nasal formant) provides look-ahead cues to the nasal manner' (Wright 2004, 39, citing Ali, Gallager, Goldstein & Daniloff 1971, Hawkins & Stevens, 1985).

So, it is clear why the sound [n] is more salient in postvocalic position than in postnasal position; specifically, why the suffix [n] is more salient in the output like [sømːen] than in [sømn]. The vowel and the nasal have different frequencies and amplitudes, providing signal modulation, facilitating segmentation. The vowel-nasal transition (in this case, [e]-[n]) provides clear formant transitions into the nasal, cueing the coronal place of articulation. The vowel carries some nasalization, helping the listener to identify the nasal manner of articulation. Summarizing, segmental status, place, and manner of [n] is easy to identify in postvocalic position.

In contrast, the sound [n] after a nasal is highly non-salient. First, the signal modulation between the [m] and [n] is minimal, since the sounds are so similar, both in terms of frequency and amplitude. So, segmental parsing is impeded. Second, the [m]-[n] transition in the hypothetical bimorphemic output allomorph [sømn] provides no V-C formant transitions to signal place. Third, the nasalization on the vowel is triggered by the [m], not the suffix, so the informative look-ahead cue of nasalization serves no purpose in facilitating the perception of the suffix. In short, segmental status, place, and manner of [n] are difficult to identify in postnasal position.

We might summarize these facts in a chart:

(16)

| | | n/N_# | n/V_# |
|---|---|---|---|
| Signal modulation: spectral shape | | WEAK CUE | STRONG CUE |
| Signal modulation: amplitude | | NO CUE | STRONG CUE |
| Place: | V-C formant transition | WEAK CUE | STRONG CUE |
| Manner: | Nasalization on preceding segment, conditioned by /n/ | NO CUE | STRONG CUE |

These facts suggest the following P-map fragment:

(17)

| Context<br>Morphemes | N_# | V_# |
|---|---|---|
| n/∅ | n/∅ | n/∅ |

That is, the morphemes /n/ and ∅ are highly confusable, i.e., perceptually non-distinct in the context N_#. The high confusability is represented by means of the small font. The same morphemes /n/ and ∅ are not highly confusable in the context V_#.

Recall the principle of constraint projection:

(18) = (15)

**P-map-to-ranking projection of *NONDIST MORPH**

For two contexts $K_a$ and $K_b$,

and two tautoparadigmatic morphemic exponences $m_i$ and $m_j$ ,

If $\Delta\ (m_i,m_j)\ /K_a \quad < \quad \Delta\ (m_i,m_j)\ /\ K_b$ ,

then *NONDIST MORPH ($m_i$,$m_j$ / $K_a$) ≫ *NONDIST MORPH ($m_i$,$m_j$ / $K_b$).

We have here two contexts, N_# and V_#; and we have two morphemes /n/ and ∅. The difference between /n/ and ∅ in context N_# is smaller than their difference in context V_#. This generates, according to the principle of constraint projection, the following ranking:

(19) *NONDIST MORPH (n,∅/N_#) ≫ *NONDIST MORPH (n,∅/V_#)

Then, epenthesis is simply driven by a DEP-V constraint interleaved between these two relativized *NONDIST MORPH constraints. Since DEP-V is ranked lower than *NONDIST MORPH (n,∅/N_#), epenthesis applies to m-final stems, as the following tableau illustrates:

(20)

| /søm: + n/ | *NONDIST MORPH (n,∅/N_#) | DEP-V | *NONDIST MORPH (n,∅/V_#) |
|---|---|---|---|
| a. sømn | *! | | |
| b. > søm:en | | * | * |

On the other hand, the epenthetic form is harmonically bounded by the non-epenthetic form in the case of vowel-final stems:

(21)

| /by + n/ | *NONDIST MORPH (n,∅/N_#) | DEP-V | *NONDIST MORPH (n,∅/V_#) |
|---|---|---|---|
| a. > by:n | | | * |
| b. by:en | | *! | * |

For this reason, no epenthesis takes place after vowel-final stems.

Crucially, the *NONDIST MORPH constraints only apply to morphemes, not phonemes. It is for this reason that it does not apply the [n] in the monomorpheme /sømn/ 'sleep'. The relevant markedness constraint—call it *PHONOTACTIC n/N_#, —is ranked sufficiently low in the Swedish grammar, so as to play no role in choosing the winning output.:

(22)

| /sømn/ | *NONDIST MORPH (n,∅/N_#) | DEP-V | *NONDIST MORPH (n,∅//V_#) | *PHONO-TACTIC (n/N_#) |
|---|---|---|---|---|
| a. > sømn | | | | * |
| b. søm:en | | * | * | |

## 5. Why no epenthesis after lateral-final[4] with penultimate stress?

Lateral-final stems behave schizophrenically, sometimes following the epenthesis pattern of nasal-final stems and sometimes following the non-epenthesis pattern of vowel-final stems. Lateral-final stems with penultimate stress do not trigger epenthesis. Recall the following data:

(23)

| SG. = STEM | * | NON-N. SG. DEF. | GLOSS |
|---|---|---|---|
| [ˈsyk:el] | [ˈsyk:el**en**] | [ˈsyk:el**n**] | 'bicycle' |
| [ˈfo:gel] | [ˈfo:gel**en**] | [ˈfo:gel**n**] | 'bird' |
| [ˈkonsʉl] | [ˈkonsʉl**en**] | [ˈkonsʉl**n**] | 'consul' |

This is reminiscent of vowel-final stems with penultimate stress, which also do not trigger epenthesis:

(24)

| SG. = STEM | * | NON-N. SG. DEF. | GLOSS |
|---|---|---|---|
| [ˈblom:a] | *[ˈblom:a**en**] | [ˈblom:a**n**] | 'flower' |
| [ˈtod:y] | *[ˈtod:y**en**] | [ˈtod:y**n**] | 'toddy' |

Nasal-final words with penultimate stress, in contrast, do trigger epenthesis:

(25)

| STEM | * | NON-N. SG. DEF. | GLOSS |
|---|---|---|---|
| [ˈpilgrim] | *[ˈpilgrim**n**] | [ˈpilgrim**en**] | 'pilgrim' |
| [ˈçyk:liŋ] | *[ˈçyk:liŋ**n**] | [ˈçyk:liŋ**en**] | 'chicken' |

In short, when a stem has penultimate stress, lateral-final stems pattern like vowel-final stems, not like nasal-final ones.

Lateral-final stems with final stress, however, pattern like nasal-final stems, and unlike vowel-final stems. Stems of this structure always license epenthesis before the article. The following list features monosyllabic stems ending in either singleton /l/ or geminate /l:/.

[4] The patterns described apply to r-final stems as well. I set them aside, however, since there is a confound in this case: [r] followed by [n] coalesces into a postalveolar nasal. This introduces complications beyond the present thesis.

(26)

| STEM | * | NON-N. SG. DEF. | GLOSS |
|---|---|---|---|
| [piːl] | *[piːl**n**] | [ˈpiːl**en**] | ‘arrow’ |
| [vɑːl] | *[vɑːl**n**] | [ˈvɑːl**en**] | ‘whale’ |
| [grilː] | *[gril**n**] | [ˈgrilː**en**] | ‘barbecue’ |
| [valː] | *[val**n**] | [ˈvalː**en**] | ‘rampart’ |

The following list features the same pattern in polysyllabic stems stressed on the final syllable:

(27)

| STEM | * | NON-N. SG. DEF. | GLOSS |
|---|---|---|---|
| [korˈprɑːl] | *[korˈprɑːl**n**] | [korˈprɑːl**en**] | ‘corporal’ |
| [piˈstuːl] | *[piˈstuːl**n**] | [piˈstuːl**en**] | ‘pistol’ |
| [meˈtalː] | *[meˈtal**n**] | [meˈtalː**en**] | ‘metal’ |
| [paˈtrʉlː] | *[paˈtrʉl**n**] | [paˈtrʉlː**en**] | ‘patrol’ |

This pattern of epenthesis is reminiscent of epenthesis after nasal-final stems, which always trigger epenthesis:

(28)

| STEM | * | NON-N. SG. DEF. | GLOSS |
|---|---|---|---|
| [sømː] | *[søm**n**] | [ˈsømː**en**] | ‘seam’ |
| [maˈdamː] | *[maˈdam**n**] | [maˈdamː**en**] | ‘madame’ |
| [sɛŋː] | *[sɛŋː**n**] | [ˈsɛŋː**en**] | ‘bed’ |
| [maˈrɛŋː] | *[maˈrɛŋː**n**] | [maˈrɛŋː**en**] | ‘maringue’ |

This contrasts with vowel-final words with final stress, which generally do not trigger epenthesis:[5]

(29)

| SG. = STEM | INCORRECT | NON-N. SG. DEF. | GLOSS |
|---|---|---|---|
| [byː] | *[ˈbyː**en**] | [ˈbyː**n**] | ‘village’ |
| [esɛː] | *[eˈsɛː**en**] | [eˈsɛː**n**] | ‘essay’ |
| [aˈleː] | *[aˈleː**en**] | [aˈleː**n**] | ‘avenue’ |

Summarizing, lateral-final stems pattern like vowel-final stems when they have penultimate stress, but they pattern like nasal-final stems when they have final stress.

[5] As noted, a few lexical exceptions exist. See Teleman 1969 for discussion.

One might say that they pattern like a cross between nasal-final stems and vowel-final stems.

Lateral-final stems pattern like something intermediate between nasal-final stems and vowel-final stems precisely because the perceptibility of [n] in postlateral position before a word-boundary—in a context we might call 'L_#'—is intermediate between the perceptibility of [n] in contexts N_# and V_#.

Let us return to Wright's observations about the cues that render the sound [n] salient. To facilitate segmentation, Wright refers to signal modulation, both in terms of frequency and amplitude. In his discussion of acoustic analysis of sounds, Ladefoged (2000, 182) notes that the amplitude correlates of nasals and laterals are similar[6]: 'A clear mark of a nasal (or...a lateral) consonant is an abrupt change [i.e., reduction in intensity] in the spectrogram at the time of the formation of the articulatory closure....' The frequencies of nasals and laterals are distinct, however: nasals have 'nasal formants at about 250, 2,500, and 3250 Hz' whereas laterals have 'formants in the neighborhood of 250, 1200 and 2400 Hz' with '[t]he higher formants...considerably reduced in intensity' (Ladefoged 2000,185). Both nasals and laterals feature formants around 250 and 2400-2500; the crucial difference is that laterals feature resonances at 1200, unlike nasals. Summarizing, nasals and laterals have a similar amplitude but vary somewhat in their frequencies. Amplitude modulation is presumably a poor cue, while frequency modulation may facilitate segmentation somewhat.

A preceding [l], being coronal, will not provide transitional place information about a following coronal, since no place transition takes place. For this reason, a transition [l]-[n] will not provide good cues to identify the coronal place of articulation of the nasal.

Wright observes that anticipatory nasalization on the segment before /n/ cues the nasal feature. Since the lateral can carry this anticipatory nasalization, nasal manner will be cued to some extent, though presumably not to the extent that it is cued in postvocalic position.

We might summarize these findings, and incorporate them with our previous findings regarding cues for [n] in contexts N_# and V_#.

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[6] I haven't yet found info on the Swedish laterals and nasals, specifically. Also, I hope to add spectrograms of a native speaker.

(30)

| | | n/N_# | n/L_# | n/V_# |
|---|---|---|---|---|
| Signal modulation: spectral shape | | Weak cue | Weak cue | Strong cue |
| Signal modulation: amplitude | | No cue | Med cue | Strong cue |
| Place: | V-C formant transition | Weak cue | weak cue | Strong cue |
| Manner: | Nasalization on preceding segment, conditioned by /n/ | No cue | Medium cue | Strong cue |

The intermediate status of cue-strength of [n] in context L_# compared to contexts N_# and V_# implies an intermediate status of confusability of distinct tautoparadigmatic morphemic exponences [n] and ∅. The following P-map fragment captures this:

(31)

| Context / Morphemes | N_# | L_# | V_# |
|---|---|---|---|
| n/∅ | n/∅ | n/∅ | n/∅ |

Following the schema above, the P-map in (52) generates the following OT rankings:

(32) *NonDist Morph (n,∅/N_#)
≫ *NonDist Morph (n,∅/L_#)
≫ *NonDist Morph (n,∅/V_#)

We know already that Dep-V is ranked between *NonDist Morph (n,∅/N_#) and *NonDist Morph (n,∅/V_#). How about its ranking with respect to *NonDist Morph (n,∅/L_#)? The epenthesis of [e] after lateral-final stressed syllables suggests the following ranking:

(33) *NonDist Morph (n,∅/N_#)
≫ *NonDist Morph (n,∅/L_#)
≫ Dep-V, *NonDist Morph (n,∅/V_#)

This generates an output with epenthetic [e].

(34)

| /ˈɑːl + n/ | *NonDist Morph (n,∅/N_#) | *NonDist Morph (n,∅/L_#) | Dep-V | *NonDist Morph (n,∅/V_#) |
|---|---|---|---|---|
| a. ˈɑːln | | *! | | |
| b. > ˈɑːlen | | | * | |

Now, consider the l-final trochee stems. Recall that these fail to trigger epenthesis. The constraints that we have posited generate the incorrect output; the relative ranking *NonDist Morph (n,∅/L_#) ≫Dep-V inevitably favors an output with epenthetic [e]:

(35)

| /ˈkonsʉl + n/ | *NonDist Morph (n,∅/N_#) | *NonDist Morph (n,∅/L_#) | Dep-V | *NonDist Morph (n,∅/V_#) |
|---|---|---|---|---|
| a. ˈkonsʉln | | *! | | |
| b. 💣 ˈkonsʉlen | | | * | |

It appears that some additional constraint is active, which disfavors candidate (b). If this constraint—call it C—were ranked above *NonDist Morph (n,∅/L_#), the correct output would be generated.

(36)

| /ˈkonsʉl + n/ | *NonDist Morph (n,∅/N_#) | C | *NonDist Morph (n,∅/L_#) | Dep-V | *NonDist Morph (n,∅/V_#) |
|---|---|---|---|---|---|
| a. > ˈkonsʉln | | | * | | |
| b. ˈkonsʉlen | | *! | | * | * |

The nature of this constraint C is the next question we will address.

## 6. A prosodic constraint

Prosodically, candidate (b) in tableau (63) is a dactyl—the pattern ˈσ σ σ—and the canonical foot in Swedish is a bisyllabic trochee (ˈσ σ) (Riad 1992). Assume that dactyls involve an unparsed final syllable, with only the first two syllables footed: (ˈσ σ) σ. Then we can naturally derive the non-optimality of candidate (b) from a constraint against unfooted syllables:

(37) PARSE-σ All syllables must be footed.

This is the constraint alluded to above—constraint C—which disprefers the candidate [ˈkonsʉlen] , leaving [ˈkonsʉln] to be the optimal candidate:[7]

(38)

| /ˈkonsʉl + n/ | *NONDIST MORPH (n,∅/N_#) | PARSE-σ | *NONDIST MORPH (n,∅/L_#) | DEP-V | *NONDIST MORPH (n,∅/V_#) |
|---|---|---|---|---|---|
| a. > (ˈkonsʉln) | | | * | | |
| b. (ˈkonsʉl)en | | *! | | * | * |

Crucially, PARSE-σ must be ranked lower than *NONDIST MORPH (n,∅/N_#), in order to generate the dactyl outputs when the non-neuter article associates with a m-final trochee stem[8]:

(39)

| /ˈpilgrim + n/ | *NONDIST MORPH (n,∅/N_#) | PARSE-σ | *NONDIST MORPH (n,∅/L_#) | DEP-V | *NONDIST MORPH (n,∅/V_#) |
|---|---|---|---|---|---|
| a. (ˈpilgrimn) | *! | | | | |
| b. > (ˈpilgrim)en | | * | | * | * |

[7] We might ask what rules out the candidate [ˈkonslen], where the stem vowel is deleted. This would satisfy both PARSE-σ and *NONDIST MORPH (n/L_#). While the plural morpheme triggers syncope in the stem, the non-neuter definite article does not. For example, the definite singular [morgonen] is dactylic, while the plural [ˈmorgnar] is trochaic, due to syncope. A given stem-internal vowel features different levels of robustness depending on the suffix; this remarkable phenomenon merits investigation.

[8] Interestingly, both Algeo (1974, 30 fn 2) and Hooper (1978, 194)—citing Zwicky 1972—note that the English rule of syncope generally fails to apply when the resulting cluster would be m-n or n-m; so no syncope applies in the words *animal or stamina*. Hooper suggests that this is due to an insufficient ‘difference in strength’ between the sounds, where ‘strength’ is sonority. The facts of Swedish suggest that this might profitably be reanalyzed as a perceptual issue.

## 7. Alternative accounts

Before setting forth our perceptual account of allomorphy, we showed the inappropriacy of an approach that relied on stem phonotactics. We will presently show that minimality, sonority sequencing, and avoidance-of-potential-neutralization are equally inappropriate, as accounts of the present allomorphy.

Given that [e]-epenthesis inevitably adds prosodic material—it adds a syllable to the stem—one might suggest that epenthesis is driven by minimality. This is not the case, however, since the default foot in Swedish is trochaic (Riad 1992), but the [e]-epenthesis occurs after nasal-final trochees, thereby creating dactyls.

(40)

| STEM | NON-N. SG. DEF. | GLOSS |
|---|---|---|
| [ˈmeːdlem] | [ˈmeːdlemen] | ‘member’ |
| [ˈvɛlːiŋ] | [ˈvɛlːiŋen] | ‘porridge’ |

The marked status of the dactyl is noted in morphologically driven syncope[9]:

(41)

| STEM | PL. AFFIX | CORRECT | * | GLOSS |
|---|---|---|---|---|
| [morgon] | [ar] | [ˈmorgnar] | *[ˈmorgonar] | ‘morning’ |

Clearly, then, minimality cannot be the driving force behind the licensing of epenthesis after nasal-final trochee, since the resulting forms are dactyls.

Furthermore, if minimality were a condition on derived forms, we would expect all polymorphemic forms to be at least trochaic.[10] This is not the case, as we can see by looking at suffixes such as the neuter /t/, participle /d/, and supine /t/. These suffixes associate with CVC stems, resulting in monosyllabic CVC+C forms.

(42)

| | STEM | CORRECT | * | GLOSS |
|---|---|---|---|---|
| PARTICIPLE | [døm:] | [dømd] | *[døm:ed] | ‘judge’ |
| SUPINE | [døm:] | [dømt] | *[døm:et] | ‘judge’ |
| NEUTER | [lɑ:m] | [lɑ:mt] | *[lɑ:met] | ‘lame’ |

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9 See Eliasson 1972 for trenchant discussion.

10 A more nuanced form of minimality might be entertained, whereby different suffixes have different minimality requirements. I will set aside this hypothesis, for reasons of learnability.

So, minimality fails to account for the epenthesis of [e] in Swedish allomorphy, since epenthesis overapplies (creating dactyls) in nasal-final trochee stems, and since epenthesis underapplies (failing to create trochees) in monosyllabic polymorphs featuring the neuter, participle, and supine suffixes.

One might wish to argue that the epenthesis after lateral-final stems and nasal-final stems is driven by sonority sequencing. No doubt, the nasal suffix /n/ is close to the lateral and nasals in terms of the sonority scale. If there were some minimum sonority distance that applied in complex codas, perhaps this could explain the vowel-epenthesis.

This approach cannot work, however. If we consider the participle, supine, and neuter suffixes, we note that zero sonority distances are grammatical in complex codas. The participle suffix is /d/, and it is grammatical after another voiced stop, e.g., /g/:

(43)

| | STEM | SR | * | GLOSS |
|---|---|---|---|---|
| PARTICIPLE | [tigː] | [tigd] | *[tiged] | ‘beg’ |

Similarly, the supine and neuter suffixes are /t/, and they appear without epenthesis after other voiceless stops, e.g., /k/:

(44)

| | STEM | SR | * | GLOSS |
|---|---|---|---|---|
| SUPINE | [slɛkː] | [slɛkt] | *[slɛkːet] | ‘extinguish’ |
| NEUTER | [çɛkː] | [çɛkt] | *[çɛkːet] | ‘smart, stylish’ |

So there is no reason to assume that a minimum sonority distance is driving the epenthesis in the non-neuter definite suffix.

Bakovic 2005 presents a conceptually interesting account of English –ed and –s allomorphy, where a vowel is epenthesized to avoid a geminate or a near-geminate. To account for the notion of ‘sufficient identity’ which is generally assumed to be the driving force behind antigemination, he suggests that ‘if a vowel were *not* epenthesised between prefix and stem...the expected result *would be* a sequence of adjacent identical consonants’ (Bakovic 2005, 280), which, if forbidden by the grammar in question, can force epenthesis. The thesis ‘makes a novel substantive claim: any feature ignored in the determination of identity for the purposes of antigemination must be one that can be independently justified by a separate pattern of avoidance of adjacent consonants that differ in terms of that feature' (Bakovic 2005,280) According to this account, 'the applicability of one process (epenthesis) is dependent on the *potential* result of another (assimilation)' (Bakovic 2005, 281).

For example, take English –ed allomorphy. Voicing assimilation (AGREE (voi) ≫ IDENT (voi)) results in a devoiced /d/ suffix after a p-final stem:

(45)

| | /p + d/ | NO GEM | AGREE (voice) | DEP-V | IDENT (voice) |
|---|---|---|---|---|---|
| a. | > pt | | | | * |
| b. | pd | | *! | | |
| c. | pəd | | | *! | |

For a d-final stem, schwa is epenthesized in the output, since NOGEM outranks DEP-V:

(46)

| | /d + d/ | NO GEM | AGREE (voice) | DEP-V | IDENT (voice) |
|---|---|---|---|---|---|
| a. | > dəd | | | * | |
| b. | dd | *! | | | |
| c. | dt | | *! | | * |

For a t-final stem, schwa is also epenthesized in the output. This is so, according to Bakovic, since both NOGEM and AGREE (voi) outrank Dep-V.

(47)

| | /t + d/ | NO GEM | AGREE (voice) | DEP-V | IDENT (voice) |
|---|---|---|---|---|---|
| a. | > təd | | | * | |
| b. | td | | *! | | * |
| c. | tt | *! | | | |

With this ranking, both candidates (b) and (c) are disfavored to candidate (a), with epenthesized schwa. The epenthesis in the allomorph is, then, the result of a total ban on geminates in addition to a constraint that assimilates [td] clusters.

This account cannot be applied to the Swedish facts. First, there is no inviolable constraint NOGEM in Swedish. Geminate consonants abound in the language. Since we are focusing on nasals, I will only illustrate some examples of geminate nasals:

(48)

| STEM | GLOSS |
|---|---|
| [lamː] | 'lamb' |
| [spanː] | 'bucket' |
| [soŋː] | 'song' |

Furthermore, [e]-epenthesis in Swedish is independent of potential assimilatory processes. While the epenthesis after sonorants [l m ŋ] is intuitively linked to their similarity to the affix [n], these sounds do not neutralize. Recall some examples:

(49)

| STEM | GLOSS |
|---|---|
| [moːln] | 'lamb' |
| [hamn] | 'harbor' |
| [vaŋn] | 'wagon' |

The l-final stems with penultimate stress, like [konsʉl + n], illustrate that there is no assimilation across morpheme boundaries, either.

## 8. Application to English Plural /z/[11]

### 8.1 Introduction

For a theory of allomorphy to be of interest, it must generalize to various cases of allomorphy in the languages of the world. Perhaps the most famous case of allomorphy in the generative literature is the English plural allomorphs, which vary between /z/, /s/, and /əz/. It is familar that they surface after voiced non-stridents, voiceless non-stridents, and stridents, respectively.

(50)

| stem-final sound | UR | SR |
|---|---|---|
| Voiced nonstrident | /ræg + z/ | /rægz/ |
| Voiceless nonstrident | /ræk + z/ | /ræks/ |
| Strident | /ræʃ + z/ | /ræʃəz/ |

[11] Obviously the points also apply to the English genitive and third person singular simple present.

The alteration s~z is a mundane instance of voicing assimilation, and merits no further comment. In the literature, the formulation of schwa-epenthesis between stridents is generally ascribed to a phonotactic ban on sequential tautomorphemic stridents (Langacker 1968; see also Bakovic 2005 for discussion and further references). I will presently show how Wright's contextual cues, Steriade's P-map, and the novel constraint *NONDIST MORPH can be used to capture the pattern.

## 8.2 Plural /z/ and singular ∅

Just as the phonetic exponence Swedish definite morpheme /n/ has to be maintained distinct from the non-definite morpheme ∅, so the phonetic exponence English plural /z/ has to be kept distinct from the tautoparadigmatic singular ∅.

Consider three words: *dish, lathe,* and *flea.* By the principle of paradigmatic distinctness, the plural of these words must be saliently distinct from the singular. Assuming that the plural morpheme is /z/, the crucial question is whether the sound /z/ is sufficiently distinct from ∅ in contexts ʃ_#, ð_#, and V_#.

Wright 2004 makes explicit the criteria for identifying place, manner, and segmental status of a sibilant such as /z/. The F2 transitions from a vowel into the consonant 'provide the listener with cues to the place of articulation....' (Wright 2004, 5) In addition, '[t]he spectrum of the frication noise is sufficient for listeners to reliably recover the place of articulation in the sibilant fricatives' (Wright 2004, 6), so some information about coronality can be retrieved irrespective of F2 transitions. Also, the strident fricative manner can be retrieved from the rich internal cues of the sibilant sound. The segmental status of the affix /z/ is perceived in the context of rich modulation in frequency and amplitude—the more distant the preceding segment's frequency and amplitude are from those of /z/, the better the segmental status of /z/ will be retrieved. So, the segmental status of /z/ will be easily recovered after vowels, since their frequencies are much lower than those of /z/. It will harder to recover after non-strident fricatives, whose frequencies approach those of /z/; and harder still to recover after strident fricatives, which share the high frequencies and loudness of /z/. Summarizing, we have the following chart

(51)

| | | z/ʃ_# | z/ð_# | z/V_# |
|---|---|---|---|---|
| Signal modulation: spectral shape | | WEAK CUE | MEDIUM CUE | STRONG CUE |
| Signal modulation: amplitude | | WEAK CUE | MEDIUM CUE | STRONG CUE |
| Place: | V-C formant transition | WEAK CUE | WEAK CUE | STRONG CUE |
| Place: | frication noise | STRONG CUE | STRONG CUE | STRONG CUE |
| Manner: | high freq. noise | STRONG CUE | STRONG CUE | STRONG CUE |

Plainly, , the cues for /z/ are weakest in post-strident position. It is equally plain that the cues for /z/ are strongest in postvocalic position, due to V-C transitions and rich signal modulation. A P-map fragment representing the relative distinctiveness between /z/ and ∅ follows:

(52)

| Context / Morphemes | ʃ_# | ð_# | V_# |
|---|---|---|---|
| z/∅ | z/∅ | z/∅ | z/∅ |

Recall our ranking convention, by virtue of which we project *NONDIST MORPH constraints from the P-map:

(53) = (15)

**P-map-to-ranking projection of *NONDIST MORPH**

For two contexts $K_a$ and $K_b$,

and two tautoparadigmatic morphemic exponences $m_i$ and $m_j$ ,

If $\Delta (m_i,m_j) / K_a \quad < \quad \Delta (m_i,m_j) / K_b$ ,

then *NONDIST MORPH $(m_i,m_j / K_a) \gg$ *NONDIST MORPH $(m_i,m_j / K_b)$.

The P-map in (52), together with the projection convention in (53), generate the following rankings in the OT tableau:

(54) *NONDIST MORPH (z,∅/ʃ_#)

≫ *NONDIST MORPH (z,∅/ð_#)

≫ *NONDIST MORPH (z,∅/V_#)

If we furthermore rank DEP-V—the anti-epenthesis constraint—between *NONDIST MORPH (z,∅/ʃ _#) and *NONDIST MORPH (z, ∅/ð _#), we generate the correct outputs. Consider some tableau for the plural forms of 'flea', 'lathe', and 'dish', where the competing candidates are minimally distinct in terms of including or lacking an epenthetic vowel before the suffix. In each tableau, the epenthetic candidate features violations of DEP-V—since a vowel has been inserted—and *NONDIST MORPH (z, ∅/V_#)—since said epenthetic vowel will generate a [ə]-[z] contour for the suffix. The non-epenthetic candidate will violate different *NONDIST MORPH constraints in each tableau, depending on the stem-final consonant.

In the word 'fleas', the non-epenthesis candidate, like the epenthesis candidate, violates *NONDIST MORPH (z/V_#), since the stem ends in a vowel.

(55)

| 'fleas' / fli + z/ | *NONDIST MORPH (z/ʃ_#) | DEP-V | *NONDIST MORPH (z/ð_#) | *NONDIST MORPH (z/V_#) |
|---|---|---|---|---|
| a. > fliz | | | | * |
| b. fliəz | | *! | | * |

Since the epenthesis candidate also violates DEP-V, this candidate harmonically bounded.

Now, take the word 'lathes'. The non-epenthesis alternative candidate violates *NONDIST MORPH (z,∅/ð_#).

(56)

| 'lathes' / leið + z/ | *NONDIST MORPH (z,∅/ʃ_#) | DEP-V | *NONDIST MORPH (z,∅/ð_#) | *NONDIST MORPH (z,∅/V_#) |
|---|---|---|---|---|
| a. > leiðz | | | * | |
| b. leiðəz | | *! | | * |

Since DEP-V is ranked higher than *NONDIST MORPH (z,∅/ð_#), the non-epenthesis candidate is optimal.

Now, consider 'dishes'. Here, the non-epenthesis candidate violates *NONDIST MORPH (z,∅/ʃ_#).

(57)

| | 'dishes' /dɪʃ + z/ | *NONDIST MORPH (z,∅/ʃ_#) | DEP-V | *NONDIST MORPH (z,∅/ð_#) | *NONDIST MORPH (z,∅/V_#) |
|---|---|---|---|---|---|
| a. | dɪʃz | *! | | | |
| b. > | dɪʃəz | | * | | * |

Crucially, *NONDIST MORPH (ʃ_#) is ranked higher than DEP-V, so the non-epenthesis candidate is ruled out, and the epenthesis candidate is optimal.

## 9. *NONDIST MORPH and Evolutionary Phonology

The present study relies explicitly on the inherent perceptual properties of sounds in given contexts. As such, it is at odds with the central thesis of Evolutionary Phonology (henceforth, EP), according to which sound patterns are mere artifacts of transmission of language from one generation to the next.

The proposal makes crucial reference to the P-map, which drives the epenthesis pattern in the paradigm of the Swedish non-neuter singular definite suffix. The following relative rankings were shown to be crucial:

(58)

*NONDIST MORPH (n,∅/N_#)
≫ *NONDIST MORPH (n,∅/L_#)
≫ *NONDIST MORPH (n,∅/V_#)

This relative ranking was projected from the following P-map fragment:

(59) = (31)

| Context / Morphemes | N_# | L_# | V_# |
|---|---|---|---|
| n/∅ | n/∅ | n/∅ | n/∅ |

Reference to the primary content of the sounds is essential here—the relative confusability between [n] and ∅ in various segmental contexts drives the present analysis. If the classes 'nasals', 'laterals', and 'vowels' were simply handy expositional devices, unmotivated by actual phonetic properties, then the present proposal would be stipulative, descriptive, and of no interest. In short, there would be no account of the epenthesis pattern in Swedish.

In this sense, the present proposal is at odds with EP as presented in the work of Blevins. Blevins (2004, 27) claims that

> [t]here is no need to encode the primary content of phonological representations and constraint systems in the human mind, since these properties can be shown to emerge from natural processes of language change inherent to the transmission of language from one generation to the next.

But without encoding the content of the phonological representations, how can we obtain the gradient effect of epenthesis, depending on the identity of the stem-final consonant? Recall the pattern:

| (60) | STEM-FINAL SOUND | EPENTHESIS BEFORE /N/ SUFFIX? |
|---|---|---|
| | nasal | always |
| | lateral | sometimes |
| | vowel | never |

The gradient yet systematic pattern of epenthesis mirrors the gradient systematic perceptibility of the sound [n] in these three environments.

It is important to note that the patterns under discussion cannot be swept aside as artifacts of speech transmission, assumed to be central in the framework of Evolutionary Phonology. Blevins (2004, 32 ff.) provides three mechanisms for generating phonological patterns through speech transmission: these are called CHANGE, CHANCE, and CHOICE. Let us see why the Swedish epenthesis pattern cannot be reduced to either one of these three mechanisms.

CHANGE involves 'ambiguous segmentation as its primary basis.' That is, '[t]he phonetic signal is *misheard* by the listener due to perceptual similarities of the actual utterance with the perceived utterance.' If this were the mechanism behind the epenthesis pattern in Swedish, we would expect word-final clusters such as [mn], [ŋn] and [ln] to be 'misheard' as [men], [ŋen] and [len]. However, we know that these clusters are not ‘misheard’ by native Swedes, since they are perceived accurately in monomorphemes such as [sømn] ‘sleep’, [sɛŋn] ‘legend’ and [ɑːln] ‘el’.

The second mechanism in Evolutionary Phonology is CHANCE. This arises when ‘[t]he phonetic signal is...intrinsically phonologically ambiguous’ such that ‘the listener associates a phonological form with the utterance which differs from the phonological form in the speaker’s grammar’ (Blevins 2004, 32). However, there is no sense in which the clusters [mn], [ŋn] and [ln] are ‘phonologically ambiguous’. Native speakers identify them impeccably tautomorphemically, yet they split them apart when they are heteromorphemic. There is no ambiguity here, only functional systematicity. Clearly, then, this mechanism fails to explain the Swedish pattern.

A third source of sound change involves ‘the intrinsic variability of speech along the hyper-to-hypoarticulated continuum.’ Blevins (2004, 33) elaborates on this notion, called CHOICE:

> In all languages, speech varies according to rate. If, from the pool of variants, a listener chooses, as basic, a form which was non-basic for the speaker, sound change can occur.

This third mechanism also fails to capture the pattern of Swedish epenthesis before the non-neuter singular article. There is no reason to assume that speech rate is involved in the allomorphic pattern. If one were to entertain this hypothesis, the onus would lie on the linguist to generate the gradient pattern of epenthesis vowel-lateral-nasal as a natural corollary of speech rate.[12]

Also, if epenthesis before the article involves ‘varying speech rate’, then the systematic patterns of epenthesis should reflect varying speech rates. For example, the presence of epenthesis after nasal-final trochees ([ˈpilgrim] → [ˈpilgrimen] ‘pilgrim’) , contrasted with the absence of epenthesis after lateral-final trochees ([ˈkonsʉl] → [ˈkonsʉln] ‘consul’) suggests that nasal-final trochees and lateral-final trochees feature different rates of production. There is no reason to assume that this is the case.

In short, the mechanisms of CHANGE, CHANCE, and CHOICE shed no light on the epenthesis pattern before the non-neuter singular suffix. The pattern provides empirical

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[12] Note, crucially, that in order to salvage the concept of CHOICE here, it would not do to regard speech rate as an artifact of perception-optimization, in the sense that hyperarticulation counterbalances poor perceptibility, and hyperarticulation could be regrammaticized as epenthesis. This thesis inevitably involves constructing formal representations with ‘primary content’, counter to EP.

evidence for phonetic scales for morphemic exponence, as distinct from scales of phonemic exponence often assumed to drive phonotactics (see Wright 2004). Phonological representations generated from universal perceptual scales have 'inherent content', and therefore constitutes a counterexample to Evolutionary Phonology.

## 10. Conclusion

We have seen that the family of constraints *NONDIST MORPH, projected into the phonological constraint system from relative rankings in the P-map, accounts for the allomorphy of the Swedish singular non-neuter definite suffix. The P-map, together with a principle of projection into the phonology, provides the following ranking:

(61) = (32)

| | |
|---|---|
| | *NONDIST MORPH (n,∅/N_#) |
| ≫ | *NONDIST MORPH (n,∅/L_#) |
| ≫ | *NONDIST MORPH (n,∅/V_#) |

Interleaved among these constraints are PARSE-σ , which penalizes unfooted syllables, and DEP-V, which penalizes epenthetic vowels.

(62)

| | |
|---|---|
| | *NONDIST MORPH (n,∅/N_#) |
| ≫ | PARSE-σ |
| ≫ | *NONDIST MORPH (n,∅/L_#) |
| ≫ | DEP-V, *NONDIST MORPH (n,∅/V_#) |

This ranking generates the patterns appropriately, and the empirical success of our family of constraints *NONDIST MORPH lends credence to our thesis of perceptually driven allomorphy. We have also noted how this *NONDIST MORPH can be used to generate the pattern of z-allomorphy in English, and furthermore how the constraint family constitutes an important counterexample against pure EP.

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UCLA
Department of Linguistics
3125 Campbell Hall
Box 951543
Los Angeles, CA 90095-1543

ingvar@humnet.ucla.edu