Word-final prevocalic consonants in English: representation vs derivation

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INTRODUCTION

§1 A well-known problem in the phonology of present-day English:

☞ word-final consonants immediately followed by a vowel in the next word display both onset-like and coda-like properties.

§2 One broadly representational solution:

- Ambisyllabicity (e.g. Kahn 1976, Gussenhoven 1986, McCarthy 1993, Raffelsiefen 2005)
  On the surface, word-final prevocalic consonants have both an onset attachment and a coda attachment.

Two broadly derivational solutions:

- Transderivational correspondence (e.g. Hayes 2000)
  On the surface, word-final prevocalic consonants are in the onset, but they take part in a relationship of transderivational correspondence with (prepausal) tokens in coda position.
- Cyclicity and stratification (e.g. Kiparsky 1979, McCarthy 1991)
  Word-final prevocalic consonants are in the coda at the word-level, and are resyllabified as onsets at the phrase level.

§3 The ambisyllabic solution is too rigid:

☞ Different phonological processes may target different prosodic spans (Nespor and Vogel 1982, 1986): e.g. consonantal lenition may target weak positions in the syllable (i.e. the coda) or weak positions in the foot (i.e. anywhere outside the onset of the head syllable) (John Harris 2003).

However, ambisyllabicity tries to make the syllable do the work of all prosodic categories. This results in paradoxes: there are English dialects in which the pattern of ambisyllabification required to describe one phenomenon (e.g. /t/-flapping) is inconsistent with the pattern of ambisyllabification required to describe another phenomenon (e.g. /l/-darkening).

§4 The transderivational solution is too lax:

☞ Let there be the nested cyclic domains $[_{\gamma} \ldots [_{\beta} \ldots [_{\alpha} \ldots] \ldots] \ldots]$. If a process is opaque in β because its domain is α, then it will also be necessarily opaque in γ.

Transderivational correspondence misses this generalization: it fails to capture —except by stipulation— the fact that, if a process overapplies to stem-final consonants before vowel-initial word-level suffixes (e.g. /l/-darkening in *hea*[ɬ]-*ing*), then it also overapplies to word-final consonants before vowel-initial words (e.g. *hea*[ɬ] *it*).

§5 The cyclic solution offers precisely the right degree of flexibility:

☞ A cyclic analysis is ideally equipped to accommodate the fact that a single grammar may contain phonological processes caught at different stages in their diachronic life cycle, where the life cycle of a phonological process is governed by two forces:

- 'phonetic analogy' (a.k.a. 'rule generatization')
  Phonological innovations typically originate in narrow environments and then generalize to more inclusive conditions (Kiparsky 1988: §14.3.1 and refs therein). This generalization can proceed by enlarging the prosodic span of the process (Nespor and Vogel 1982, 1986).
- 'grammatical analogy'
  Phonological innovations typically enter the grammar as gradient processes of phonetic implementation, then they become categorical phrase-level rules, and subsequently their grammatical domains progressively shrink en route to morphologization or lexicalization (see e.g. Bermúdez-Otero 2007: §21.3.2 and references therein).

THE PROBLEM

The behaviour of /ɹ/

§6 Linking and intrusive *r*

Most nonrhotic dialects of English (e.g. RP):

- [ɹ] is allowed in canonical onset positions

e.g.	***r**ack*	[**ɹ**æk]	(word-initially before a stressed vowel)
	***r**accoon*	[**ɹ**əˈkuːn]	(word-initially before an unstressed vowel)

- [ɹ] is forbidden in canonical coda position

e.g.	*car*	[kɑː, *kɑː**ɹ**]	(prepausally)
	cart	[kɑːt, *kɑː**ɹ**t]	(preconsonantally)

- [ɹ] is allowed word-finally before a vowel

e.g.	*car alarm*	[kɑː**ɹ** əlɑːm]	(linking *r*)
	law officer	[lɔː**ɹ** ɒfɪsə]	(intrusive *r*)

∴ In these dialects, word-final prevocalic /ɹ/ has an onset attachment on the surface.

There are nonrhotic dialects with other patters of /ɹ/-distribution:
- no linking or intrusive *r*: e.g. AAVE [mɪstə (ʔ)ædəmz] (Gick 2002: 171);
- [ɹ] forbidden in non-foot-initial onsets: e.g. Southern US *ve*[∅]*y, pa*[∅]*ent* (John Harris 2006: 4).

§7 /ɹ/-lenition

Word-final prevocalic /ɹ/, including linking and intrusive *r* in nonrhotic dialects, exhibits lenition (is less consonantal, more vocalic) in comparison with canonical onset /ɹ/:

- smaller duration (Cruttenden 2001: 289 on nonrhotic RP)
- less lip protrusion and rounding (Wells 1990a on nonrhotic RP)
- smaller magnitude of the tongue tip gesture (Gick 1999: 47-49 on rhotic US dialects)

- more energy at all frequencies (McCarthy 1993: 179 on nonrhotic Eastern Massachusetts: e.g. *saw eels* [sɔːɻ̩ iːlz] ≠ *saw reels* [sɔː ɹiːlz])

∴ Word-final prevocalic /ɹ/ must
  either have a coda attachment on the surface,
  or have a coda attachment at some earlier point in the derivation,
  or (in rhotic dialects) be in transderivational correspondence with a coda [ɹ].

The behaviour of /l/

§8 /l/-vocalization

Following Scobbie and Wrench (2003), I define /l/-vocalization as the absence of linguoalveolar contact in the articulation of /l/.

Scobbie and Wrench (2003) studied /l/-vocalization in 8 speakers of nonvernacular English varieties from England (South East and North), Scotland (Glasgow), and the US:

> "Seven of the eight speakers have a categorical alternation of word-final /l/ in which alveolar contact is conditioned prevocalically but not preconsonantally ("/l/ sandhi").
>
> (Scobbie and Wrench 2003: 1874)

∴ Word-final prevocalic /l/ cannot be in the same position in syllable structure as word-final preconsonantal /l/: it must have an onset attachment on the surface.

§9 /l/-darkening

Following Sproat and Fujimura (1993) and Browman and Goldstein (1995), I define /l/-darkening as follows:

[l] ('clear /l/') = coronal lead (the coronal gesture precedes the dorsal gesture)
[ɬ] ('dark /l/') = coronal lag (the coronal gesture follows the dorsal gesture)

Assuming a feature geometry such as that of Clements (1991):

coronal gesture = articulatory realization of C-place features
dorsal gesture = articulatory realization of V-place features

Sproat and Fujimura (1993) report the following pattern of /l/-darkening for 4 Midwestern US speakers:

- clear /l/ in canonical onset position: e.g. *Mr B.* [l]*ikkóvsky's*
- dark /l/ in canonical coda position: e.g. *Mr Bee*[ɬ‖]
  word-finally before a vowel: e.g. *Bee*[ɬ] *equates*

Gick (2003) replicated Sproat and Fujimura's findings in a study of a Southern Californian speaker.

∴ Word-final prevocalic /l/ must
  either have a coda attachment on the surface
  or have a coda attachment at some earlier point in the derivation
  or be in transderivational correspondence with a coda [l].

§10 Posible objection against the evidence of /l/-darkening:

> The distinction between [l] and [ɬ] is gradient rather than categorical: 'darkness' (i.e. coronal lag) varies continuously according to the duration of the preceding rhyme. Accordingly, it cannot be used to diagnose the presence or absence of resyllabification (Sproat and Fujimura 1993: 308).

§11 First counterargument:

- Hayes (2000: 98) reports the following cline in the likelihood of /l/-darkening among a group of American speakers:

  *mai**l** it* > *mai**l**-er, hai**l**-y* > *(Norman) Mai**l**er, Hay**l**ey*

- However, Sproat and Fujimura themselves found that the duration of the /Vl/ sequence does not differ significantly in items such as *Bee**l**ik*, *bee**l**-ic*, and *bee**l**-ing* (see further Sproat 1993: 178).
- Accordingly, the fact that /l/-darkening applies more frequently before word-level suffixes such as *-er, -ing, -y* than morpheme-medially must involve <u>morphological conditioning</u>.
- But, under usual interface assumptions (e.g. Myers 2000: 263), only categorical processes may be sensitive to morphology.
- Sproat and Fujimura's data are compatible with an analysis in which there is a categorical distinction between coronal lead and coronal lag in the phonology, overlaid with gradient phonetic effects controlling the precise amount of coronal lag.

  [See Zsiga (1995), McMahon (2000: §4.5.2), and Bermúdez-Otero (2007: 506) for the coexistence of categorical and gradient versions of the same process within one grammar.]

§12 Second counterargument:

- It is generally agreed that gradient phonetic phenomena (e.g. F_0, preboundary lengthening, gestural timing) are sensitive to surface prosodic structure (e.g. Gussenhoven and Rietveld 1992, Byrd 1996, Clements and Hertz 1996).
- Using a normalized measure of segmental lengthening and a procedure for compensating for speaking rate differences, Wightman et al. (1992) show how preboundary rhyme lengthening —which is inherently gradient— can nonetheless distinguish four discrete types of prosodic boundary.

Summary: the conundrum of liquid syllabification in English

§13

Segment	Position	Example	Realization	
/ɹ/ in most nonrhotic dialects	/V#ɹV/	*saw **r**eels*	[ɹ]	(unlenited)
	/V(ɹ)#V/	*mo**r**e eels*	[ɻ]	(lenited)
	/V(ɹ)#C/	*mo**r**e heels*	[∅]	(zero)
/l/ in some (US) dialects	/V#lV/	*see **L**ynn*	[l]	(consonantal, clear)
	/Vl#V/	*sea**l** it*	[ɬ]	(consonantal, dark)
	/Vl#C/	*sea**l** bins*	[ɤ̴]	(vocalic, dark)

TWO AMBISYLLABICITY PARADOXES

Kahn's classical theory of ambisyllabicity in English

§14 /t/-flapping as a diagnostic of ambisyllabicity.

In most US dialects, /t/ undergoes flapping in two environments:

- $\left\{ \begin{matrix} \text{V} \\ \text{ɹ} \end{matrix} \right\}$ __ word] V e.g. *hi*[ɾ] *Ann, hi*[ɾ] *it, a*[ɾ] *ease*
- [foot … $\left\{ \begin{matrix} \text{V} \\ \text{ɹ} \end{matrix} \right\}$ __ V …] e.g. *par*[ɾ]ty, *pari*[ɾ]y

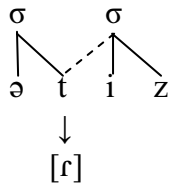
Formulating two rules would miss the generalization that flapping always occurs between a vowel or /ɹ/ and another vowel.

§15 Kahn's (1976) solution:

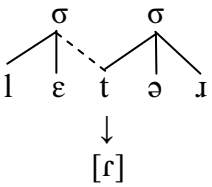
/t/ undergoes flapping iff (a) between a vowel or /ɹ/ and another vowel
and (b) in ambisyllabic position

where two separate rules bring about ambisyllabicity:

(a) Onset Capture
e.g. *at ease*
[əɹ iːz]



(b) Coda Capture
e.g. *letter*
[lɛɾəɹ]



Mr Beelik's paradox

§16 Kahn's prediction:

Kahn predicts that, unless the segmental context is different, a liquid will have the same allophonic realization in word-final prevocalic position (e.g. *seal in*) and in foot-medial intervocalic position (e.g. *Sealey*)

§17 Counterexample: The Midwestern US dialect described by Sproat and Fujimura (1993), henceforth 'the SP dialect'.

- Midwestern speakers ⇨ canonical (Kahnian) pattern of /t/-flapping
- /l/-darkening data:

Beelik	/l/ ambisyllabic by Coda Capture	⇨	**[l]** i.e. clear *l* (coronal lead)
Beel equates	/l/ ambisyllabic by Onset Capture	⇨	**[ɬ]** i.e. dark *l* (coronal lag)

∴ In the SP dialect, Kahn's syllabification works for /t/ but not for /l/

(already noticed by Sproat and Fujimura 1993: 308).

§18 Cyclic solution to Mr Beelik's paradox:

- English syllabification is onset-maximal at all levels.

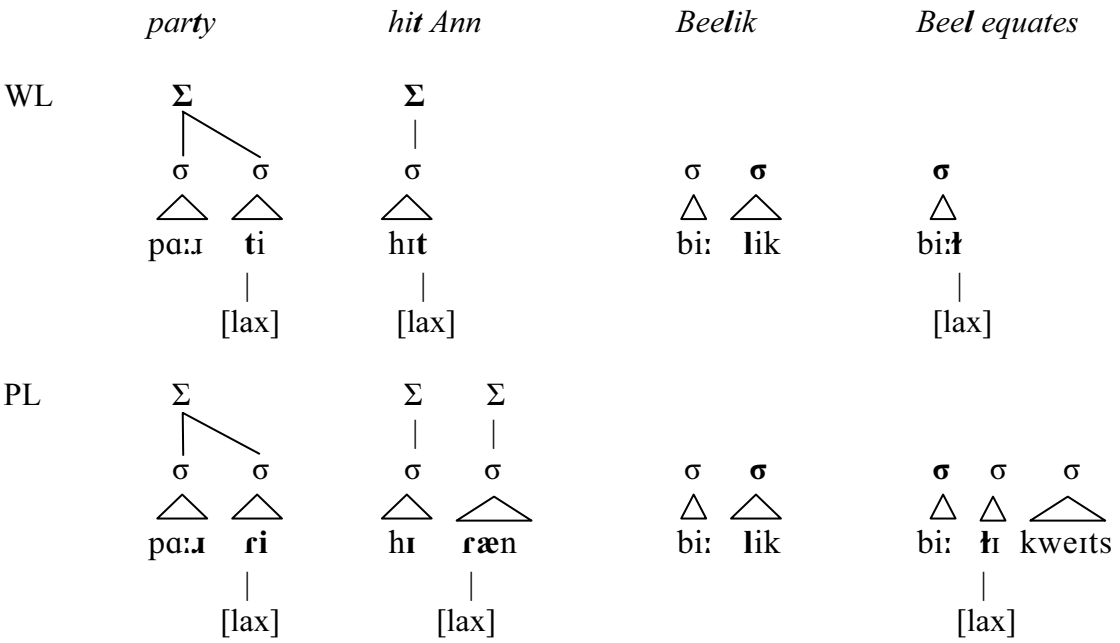
  [Therefore, word-final consonants are in the coda at the word level, but they are detached from the coda and resyllabified into the onset at the phrase level when followed by a vowel-initial word.]

- In this dialect, stop lenition is foot-based (Kiparsky 1979, John Harris 2003, Davis and Cho 2003) and word-level.

  [Assume lenition to consist of the assignment of the feature [lax]. Laxed /t/ becomes a flap at the phrase-level if intervocalic.]

- In this dialect, /l/-darkening is syllable-based and word-level.

§19



§20 The diachronic perspective:

- We know through both internal and external evidence that English developed phrase-level resyllabification into onsets during the Middle English period (Minkova 2003).

- The rôle of 'phonetic analogy' (see §5 above):

  In the SP dialect, stop lenition has reached the foot span, whereas /l/-darkening is still confined to the syllable span. However, there do exist other English dialects where /l/-darkening is more advanced, having become a foot-span process: e.g. *ye*[ɬ]*ow*, *vi*[ɬ]*age*.

  [For American English, see e.g. Olive et al. (1993: 366), Hayes (2000: 95-96); for British English, see Carter and Local (2003, 2007). Note also the contrast between nonrhotic dialects such as RP, with σ-span /ɹ/-loss, and the Southern US dialect described in Harris (2006: 4), with foot-span /ɹ/-loss: see §6.]

- The rôle of 'grammatical analogy' (see §5 above):

  Word-level processes (overapply to word-final prevocalic consonants):
  /l/-darkening in dialects like SP (§9, §17), stop lenition (§14) /ɹ/-lenition (§7)

  Phrase-level processes (do not overapply to word-final prevocalic consonants):
  full /ɹ/-loss in typical nonrhotic dialects (§6), /l/-vocalization (§8)

/ɹ/-loss is younger than /ɹ/-lenition, since it is a more extreme form of weakening.
/l/-vocalization is younger than /l/-darkening, for the same reason.

∴ We correctly predict that /ɹ/-loss and /l/-vocalization, being younger, apply in larger grammatical domains than /ɹ/-lenition and /l/-darkening.

To describe the synchronic effects of 'phonetic analogy' and 'grammatical analogy', we need two separate hierarchies:
- a hierarchy of prosodic spans
- a hierarchy of cyclic domains

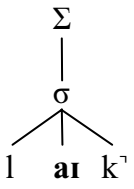
Kahnian ambisyllabicity fails because because it conflates the rôle of both hierarchies, as well as the rôle of the syllable and that of the foot.

The *látèx* paradox

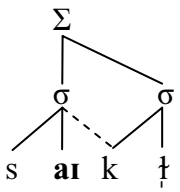
§21 In analyses assuming Coda Capture, prefortis clipping is triggered by voiceless codas:

"English vowels are subject to pre-fortis clipping, then, when they are followed by a fortis consonant within the same syllable." (Wells 1990a)

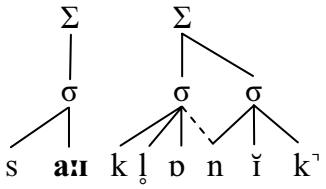
e.g.



/k/ in coda ⇨ /aɪ/ clipped

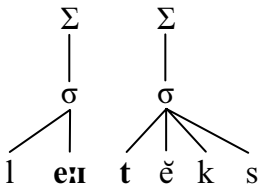


/k/ in coda by Coda Capture ⇨ /aɪ/ clipped



/k/ is not in the coda because Coda Capture is foot-bound
⇨ /aɪ/ *un*clipped

§22 Kahn's predicted US pronunciation of *látèx*: [leːɪtĕks]



/t/ is not in the coda because Coda Capture is foot-bound
⇨ /eɪ/ *un*clipped because not checked by fortis C
⇨ /t/ *un*flapped because not ambisyllabic

§23 Counterexample:

Whether or not the pronunciation [leːɪtĕks] exists, one that certainly does is [l**eɪt**ĕks], with clipped /eɪ/ but *un*flapped /t/

See e.g. Wells (1990b: sub voce *latex*). Wells's spacing indicates whether a fortis consonant causes clipping of the preceding vowel, and he notates flapped /t/ as /ţ/. Crucially, he transcribes /ˈleɪt eks/, rather than ?/ˈleɪ teks/ or ?/ˈleɪţ eks/.

Kahn's systems cannot accommodate this pronunciation: if the /t/ is not ambisyllabified, it cannot induce clipping, but if it is ambisyllabified, then it will flap.

§24 A prosodic solution:

- The environment of stop lenition is defined by the foot.
- The environment of prefortis clip is defined by the prosodic word: a vowel undergoes clipping if followed within the same prosodic word by a fortis consonant that does not belong to a stronger syllable.

Ambisyllabicity cannot model the two effects simultaneously.

⇨ But, if Kahn's analysis of the behaviour of foot-medial consonants is incorrect, then the argument for assuming that word-final prevocalic consonants are ambisyllabic collapses.

TRANSDERIVATIONAL CORRESPONDENCE: EITHER STIPULATION OR OVERGENERATION

/l/-darkening in Hayes (2000)

§25 Let's take it as established, then, that word-final prevocalic consonants surface in the onset, since they cannot be in the coda (§6, §8) and they cannot be ambisyllabic (§14-§24).

Then, why does /l/-darkening overapply to <u>word-final prevocalic /l/</u> (e.g. *hea*[ɬ] *it*) in varieties of English such as the SP dialect (§9, §17)?

Hayes's (2000) transderivational alternative to the cyclic solution:

hiːɬ ⟷ hiː.ɬɪt

PARADIGM UNIFORMITY (PHRASAL)

§26 And why does /l/-darkening overapply to <u>stem-final /l/ before vowel-initial word-level suffixes</u> (e.g. *hea*[ɬ]*ing*) in some dialects (§11)?

Hayes's (2000) transderivational alternative to the cyclic solution:

hiːɬ ⟷ hiː.ɬɪŋ

PARADIGM UNIFORMITY (MORPHOLOGICAL)

§27 But why does overapplication in *hea*[ɬ]*ing* systematically entail overapplication in *hea*[ɬ] *it* and not vice versa?

	***l**ip*	*Hea**l**ey*	*hea**l**ing*	*hea**l** it*	*hea**l***
Am 3	clear	dark	dark	dark	dark
Am 2	clear	clear	dark	dark	dark
Am 1 (=SP)	clear	clear	clear	dark	dark
RP	clear	clear	clear	clear	dark

The implicational relationships in this table are all implicit in the rates of variation reported in Hayes's (2000: 98) survey. Additionally:

- for Am 3, see also Olive et al. (1993: 366) and Jensen (1993: 128), and. cf. Carter and Local (2003) for certain non-RP British varieties;
- for Am 2, see Olive et al. (1993: 212-15);
- Am 1 is the SP dialect (§17), i.e. the dialect of the informants of Sproat and Fujimura (1993);
- for RP, see e.g. Cruttenden (2001: 201).

§28 Hayes's (2000: 102) answer: stipulating an innate fixed ranking in CON

PARADIGM UNIFORMITY (PHRASAL) » PARADIGM UNIFORMITY (MORPHOLOGICAL)

> "In the present approach, employing Optimality Theory and Paradigm Uniformity, an appropriate implementation of this idea would be to suppose that the Paradigm Uniformity constraints are a priori stricter for higher levels —for example, stricter in phrases than in words. For the case at hand we can suppose that there are separate constraints of Paradigm Uniformity for phrasal versus morphological contexts, with the former ranked within UG as necessarily stricter than the latter."

Dialect typology from first principles in a cyclic framework

§29 In a cyclic framework,

hea[ɬ] *it* ⇨ the grammatical domain of /l/-darkening excludes phrasal information
hea[ɬ]*ing* ⇨ the grammatical domain /l/-darkening excludes word-level affixes

Any cyclic domain δ that excludes word-level affixes also excludes phrasal information (e.g. δ = stem created by level-one morphology).

The Russian Doll Theorem repeated from §4:

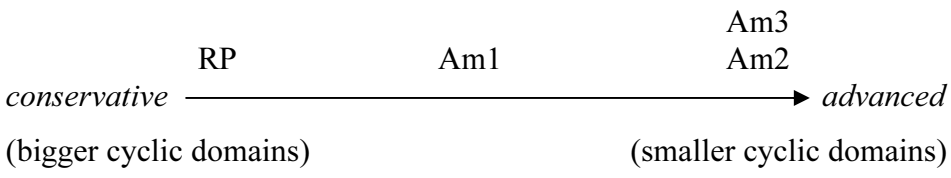
> Let there be the nested cyclic domains $[_{\gamma} \ldots [_{\beta} \ldots [_{\alpha} \ldots] \ldots] \ldots]$. If a process is opaque in β because its domain is α, then it will also be necessarily opaque in γ.

§30 Generating the dialect typology in §27:

	prosodic target of /l/-darkening	*grammatical domain of /l/-darkening*
Am 3	/l/ outside foot-initial onset	stem level or word level
Am 2	rhymal /l/	stem level ('level one')
Am 1	rhymal /l/	word level ('level two')
RP	rhymal /l/	phrase level ('postlexical')

[There is no obstacle to assigning /l/-darkening to the stem level, as Strict Cyclicity and Structure Preservation are both false (Bermúdez-Otero and McMahon 2006, Bermúdez-Otero forthcoming).]

§31 The diachronic dimension again:



METHODOLOGICAL POSTSCRIPT

§32 A well-established methodological principle of generative phonology:

☞ Phonological theory can be tested and refined by means of comprehensive analyses of a single language (e.g. Chomsky and Halle 1968, Rubach 1984, James Harris 1983, etc.)

This paper has sought to apply this principle (as far as is possible in the limited time available) by considering a reasonable wide sample of phonological processes in present-day English: linking and intrusive *r*, /ɹ/-lenition, /l/-vocalization, /l/-darkening, /t/-flapping, and prefortis clipping.

§33 Optimality Theory has introduced new methodological strictures into the discipline, since every statement about the constraint set CON entails a typological claim.

However, these new strictures will deliver progress only if we continue to abide by the old principles as well:

(a) **bad reasoning**
phonological phenomenon $\mathcal{P}$ in language L
⇩
constraint-based analysis of $\mathcal{P}$
⇩
factorial typology

(b) **good reasoning**
phonological phenomenon $\mathcal{P}$ in language L
⇩
constraint-based analysis of L
⇩
factorial typology

Work relying on (a) is inherently unsafe because, time and again, the constraint formulations and constraint rankings posited on the basis of a single phenomenon $\mathcal{P}$ in a language L prove untenable when a larger fragment of the grammar of L is considered.

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