An amphichronic approach to English syllabification

Ricardo Bermúdez-Otero
University of Manchester

PREVIEW OF THE ARGUMENT

§1 This paper is an exercise in 'amphichronic linguistics' (Kiparsky 2006, Bermúdez-Otero 2013).

It illustrates the proposition that:

- synchronic phonological universals (specially those concerning the modular architecture of grammar) delimit possible pathways of phonological change;
- but the structure of particular phonological systems cannot itself be understood without reference to the diachronic pathways from which they emerge.

§2 My evidence will be drawn from the history of phrase-level syllabification in English.

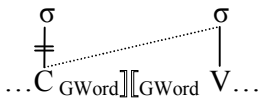
I focus on the problem of the behaviour of word-final consonants immediately followed by a vowel across a grammatical word boundary:

i.e. …C $_{\text{GWord}}$]][$_{\text{GWord}}$ V…

§3 Using both internal linguistic evidence and data from poetic metre, Minkova (2003: ch. 4) shows that,

- in Old English (OE), resyllabification was normally blocked by a process of [ʔ]-insertion that avoided empty onsets in stressed syllables;

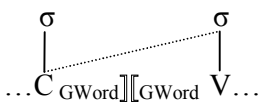
- in Middle English (ME), [ʔ]-insertion became optional, enabling the rise of phrase-level resyllabification into onsets.



The problem, surprisingly, is how to follow up Minkova's narrative into the present!

In Present-day English (PDE), word-final prevocalic consonants display both onset-like and coda-like properties;
their syllabic affiliation is, therefore, a disputed issue.

§4 Since Kahn (1976), a popular answer to the problem of the syllabic affiliation of word-final prevocalic consonants in PDE has been ambisyllabicity:



I shall argue, however, that Kahnian ambisyllabicity incurs fatal paradoxes because it attempts to use syllabification alone to describe the effects on consonantal allophony of three different factors:

the segmental environment,
stress,
and grammatical word boundaries.

The effects of these factors are **not** in fact always correlated in the way Kahn predicts.

§5 I shall demonstrate that, in the correct analysis, Minkova's narrative requires no epilogue:

☞ PDE retains unchanged the phrase-level process of full resyllabification into the onset that arose in ME.

The mixture of onset-like and coda-like properties displayed by word-final prevocalic consonants in PDE is caused by the way in which several lenition processes interact in the grammar.

In particular, an adequate description of consonantal allophony in PDE requires us to make the following two choices separately for each individual process of lenition:

- *The stratal choice:*
  Does the process apply at the stem level (SL), or at the word level (WL), or at the phrase level (PL)?
- *The prosodic choice:*
  Does the process target weak positions in σ (codas) or weak positions in Σ (positions outside the Σ-initial onset)?

§6 By fixing the stratal choice and the prosodic choice separately for each lenition process in the same grammar, do we end up with a bunch of arbitrary stipulations?

No! These synchronic choices are the outcomes of two orthogonal pathways in the diachronic evolution of phonological processes:

- *The prosodic choice* ↔ *Rule generalization*
  As phonological processes mature, their application spreads from the most favouring environments to less favouring environments:
  for lenition, $\_\__{\sigma}]$ > $[_{\Sigma}\ldots\acute{V}\ldots\_\_\ldots]$
- *The stratal choice* ↔ *Domain narrowing*
  As phonological processes age, they climb from lower to higher strata, i.e. they cyclic domains contract:
  PL > WL > SL

§7 Gratifyingly, PDE will turn out to make perfectly well-behaved choices:

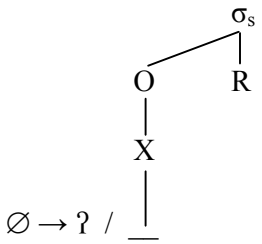
☞ In PDE, older, less aggressive lenition processes apply at higher strata;
younger, more aggressive lenition processes apply at lower strata.

MINKOVA'S NARRATIVE: PHRASAL SYLLABIFICATION IN OE AND ME

[ʔ]-insertion blocks resyllabification in OE

§8 Minkova (2003: ch. 4) makes a strong case for assuming that, like present-day German, OE avoided stressed onsetless syllables by means of [ʔ]-epenthesis:

[ʔ]-*insertion*



§9 Since root-initial syllables bear primary stress in OE, [ʔ]-insertion blocks the resyllabification of word-final consonants before lexical words beginning with a vowel:

	Ēadmund æþeling	'prince Edmund' (*The battle of Brunanburh* 3a)
UR	/æːɑ̯dmund æθeliŋg/	
SR	[ˈʔæːɑ̯d.mund.ˈʔæ.ðe.liŋg]	not *[ˈæːɑd.mun.ˈdæ.ðe.liŋg]

Minkova adduces evidence from both metrical and nonmetrical language.

§10 *Vowel alliteration*

In OE metre, any vowel-initial stressed syllable can alliterate with any other vowel-initial stressed syllable, regardless of the quality of the vowels. This suggests that the alliteration requirement is satisfied by epenthetic [ʔ].

hū þā **[ʔ]*æ***ðelingas	**[ʔ]*e***llen fremedon	(*Beowulf* 3)
'how the leaders	courage accomplished'	
[ʔ]*Æ*þelstān cyning	**[ʔ]*e***orla dryhten	(*Brunanburh* 1)
'King Æthelstan, lord of noblemen'		

§11 *Absence of elision*

In OE metre, word-final unstressed vowels always count for metrical purposes, even when immediately followed by a word-initial stressed vowel. Epenthetic [ʔ] prevents the vowels from merging:

´ × ´ ×		
*lan.**ge** **[ʔ]**āh.te*	'long reigned'	(*Beowulf* 31b)

Each halfline must contain at least four metrical positions. If elision applied to the final vowel of *lange*, the halfline would be rendered unmetrical (subminimal).

Cf. synaloepha in Spanish syllable-counting verse:

*Era del año l**a̯ e**stación florida*	(Góngora, *Soledades*, I, 1)
[e.ɾa.ðe.la.ɲo.l**a̯e̯**s.ta.θjon.flo.ɾi.<ða>]	

§12 *Hiatus between prefix and stem*

In OE, the final vowel of a prefix is retained before the initial stressed vowel of the stem. Examples from poetry where noncontraction is essential to the metre include:

¯ ´ × ¯ ´ ×
oft ***ge*.[ʔ]***æh.ted* ‘often praised’ (*Beowulf* 1885a)

Contraction was limited to negative *ne* plus a weakly stressed verb (e.g. *nis* ‘is not’), or *be* plus a weakly stressed adverb (e.g. *binnan* ‘within’).

§13 *Inorganic <-h>*

OE scribes sometimes used the letter <h> to indicate the glottal stop:

e.g. <Ða se **h**ælmihtiga> ‘when the Almighty’ (*Guthlac* 950b)

We know that this was not sociolinguistic hypercorrection for *h*-loss because:

(i) The dialect geography of *h*-loss in subsequent periods suggests that it had not yet started in OE.

(ii) The phenomenon involves inserting <h-> where there is no etymological [h-], but there is no concomitant omission of <h-> where there is.

(iii) There is more inorganic <h> in verse manuscripts (where stress and syllabification are crucial) than in prose documents. This suggests that the scribes are using <h> to represent a phonological phenomenon associated with stress.

Full resyllabification in ME

§14 Minkova demonstrates that, during the ME period, [ʔ]-insertion became optional, and that this resulted in the possibility of full resyllabification of word-final prevocalic consonants into the onset.

§15 *The decline of vowel alliteration*

In ME alliterative verse, the overall frequency of vowel alliteration drops dramatically:

OE (*Beowulf*): 15.5%
ME (*Wynnere and Wastoure*) 2.1%

Just as significantly, the proportion of cases of vowel alliteration involving identical vowels increases, suggesting that epenthetic [ʔ] is no longer there to satisfy the requirement of onset identity.

§16 *Elision and contraction*

In ME verse, the metre often requires that unstressed word-final vowels should not count when immediately followed by a vowel-initial word. This indicates that epenthetic [ʔ] was no longer there to block vowel merger:

W S W S W S W S
*þatt Godess Sun**(e)** **A**llmahhtiȝ Godd* (*Ormulum* 11042)
‘that God’s Son Almighty God’

Contraction:

W S W S W S W
þin blettsinng tunnderrganngenn (*Ormulum* 10661)
'to receive your blessing'

§17 *Stab der Liaison*

In ME alliterative verse, a word-final consonant resyllabified into the onset of a stressed syllable can participate in alliteration:

/t/ /t/ /t/
*'þat schal I **t**elle te **t**rwly,' quoþ þa.**t**̬o.þer þenne* (*SGGK* 2444)

§18 *False junctures*

ME sees an increased incidence of misanalyses where listeners misparse a resyllabified word-final consonant as word-initial

*a**n** eke name* > *a **n**eke name*
an extra name a nickname

BUT WHAT HAPPENED NEXT?

The problem of phrase-level syllabification in PDE

§19 The key difficulty: in PDE, word-final prevocalic consonants have <u>both onset-like properties and coda-like properties</u>.

The ambiguous behaviour of word-final prevocalic *r*

§20 <u>Linking and intrusive *r*</u>

Most nonrhotic dialects of English (e.g. British 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)
  *car**t*** [kɑːt, *kɑː**ɹ**t] (preconsonantally)
- [ɹ] is allowed word-finally before a vowel
  e.g. *car **r** 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* (Harris 2006: 4).

§21 /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/:

- shorter duration (Cruttenden 2001: 289, Tuinman et al. 2007: 1905-6),
- earlier timing of the tongue-root gesture (Campbell et al. 2010: 62),
- smaller magnitude of the lip gesture (Wells 1990, Campbell et al. 2010: 63-64),
- smaller magnitude of the tongue-tip gesture (Gick 1999: 47-49, Campbell et al. 2010: 63-64),
- greater magnitude of the tongue-root gesture (Campbell et al. 2010: 63-64),
- greater intensity (McCarthy 1993: 179, Tuinman et al. 2007: 1905-6),
- higher F3 (Hay and Maclagan 2010).

e.g. *saw eels* [sɔːɻ̩ iːlz] ≠ *saw reels* [sɔː ɹiːlz]) (McCarthy 1993: 179)

∴ 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.

The ambiguous behaviour of word-final prevocalic /l/

§22 /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.

§23 /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.

Summary: the conundrum of phrase-level liquid syllabification in English

§24 The *r*-conundrum

Segment	Position	Example	Realization	
	/V#ɹV/	*saw **r**eels*	[ɹ]	(unlenited)
/ɹ/ in most nonrhotic dialects	/V(ɹ)#V/	*mo**r**e eels*	[ɾ̞]	(lenited)
	/V(ɹ)#C/	*mo**r**e heels*	[∅]	(zero)

§25 The *l*-conundrum

Segment	Position	Example	Realization	
	/V#lV/	*see **L**ynn*	[l]	(consonantal, clear)
/l/ in some (US) dialects	/Vl#V/	*seal it*	[ɬ]	(consonantal, dark)
	/Vl#C/	*seal bins*	[ɤ̟ː]	(vocalic, dark)

AMBISYLLABICITY IS *NOT* THE ANSWER

The idea

§ 26
- Synchronically, PDE word-final prevocalic consonants display both onset-like and coda-like properties because they are ambisyllabic (by Onset Capture: Kahn 1976, Gussenhoven 1986).
- Diachronically, ambisyllabification replaces full resyllabification during ModE as word-final prevocalic consonants recover their coda attachment by analogy with their counterparts in nonprevocalic position.

Kahn's classical theory of ambisyllabicity in English

§27 /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

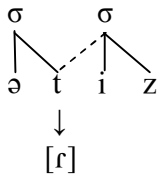
Formulating two rules would miss the generalization that flapping always occurs between a vowel or /ɹ/ and another vowel.

§28 Kahn's (1976) solution:

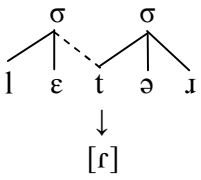
/t/ undergoes flapping iff (a) between a vowel or /ɹ/ and another vowel
and (b) in ambisyllabic position

where two separate rules bring about ambisyllabicity:

(a) Onset Capture
e.g. *a**t** ease*
[əɾ iːz]



(b) Coda Capture
e.g. *le**tt**er*
[lɛɾəɹ]



***Mr Beelik*'s paradox (Bermúdez-Otero 2011: 2038-9)**

§29 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*)

§30 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/

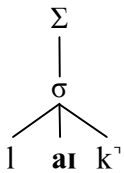
(already noticed by Sproat and Fujimura 1993: 308).

The *látèx* paradox (Bermúdez-Otero 2007b: §21-§24)

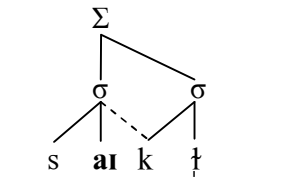
§31 In analyses assuming Coda Capture, prefortis clipping is triggered by voiceless codas:

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

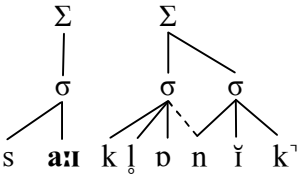
e.g.



/k/ in coda ⇨ /aɪ/ clipped

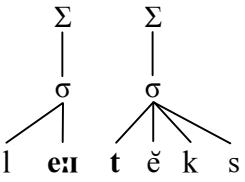


/k/ in coda by Coda Capture ⇨ /aɪ/ clipped



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

§32 Kahn's predicted US pronunciation of *látèx*: [leːɪtěks]



/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

§33 Counterexample:

Whether or not the pronunciation [leːɪtěks] exists, one that certainly does is

[l**eɪt**ěks] with clipped /eɪ/ but *un*flapped /t/

See e.g. Wells (2008: sub voce *latex*).

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.

THE ANSWER: STRATIFICATION, PROSODY, AND THE LIFE CYCLE OF PHONOLOGICAL PROCESSES

The cyclic solution to *Mr Beelik*'s paradox (Bermúdez-Otero 2007b: §18-§20, 2011: 2039)

§34 English syllabification is onset-maximal at all levels (see §5 above).

[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.]

§35 *Plosive lenition (flapping)*

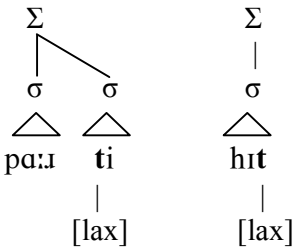
- The prosodic choice — Plosives lenite in positions outside the foot-initial onset.
- The stratal choice — Plosives lenite at the word level.

Assume that lenition involves a featural change: add the feature [lax].
Word-final prevocalic stops lenite because they are foot-final at the word level.
Subsequently, laxed /t/ becomes a flap at the phrase level if intervocalic

Analysis due to Kiparsky (1979); see also Harris (2003) and Davis and Cho (2003).

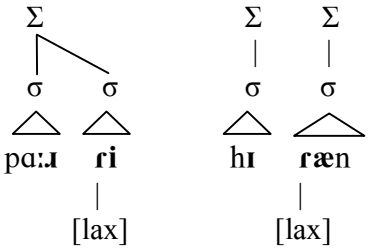
§36 *par**t**y* *hi**t** Ann*

WL



/t/ becomes lax in non-foot-initial position.

PL



Full resyllabification into the onset.
[t] flaps if it is lax and intervocalic.

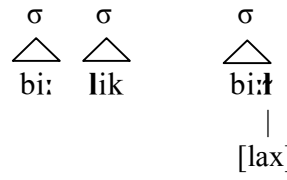
§37 *Lateral lenition (darkening)*

- The prosodic choice /l/ darkens in the coda.
- The stratal choice /l/ darkens at the word level.

Word-final prevocalic /l/ darkens because it is in the coda at the word level.

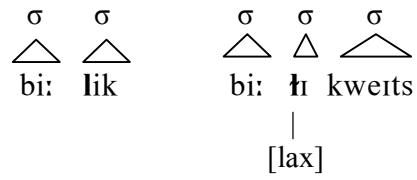
§38 *Bee**l**ik* *Bee**l** equates*

WL



/l/ darkens in the coda.

PL



Full resyllabification into the onset.

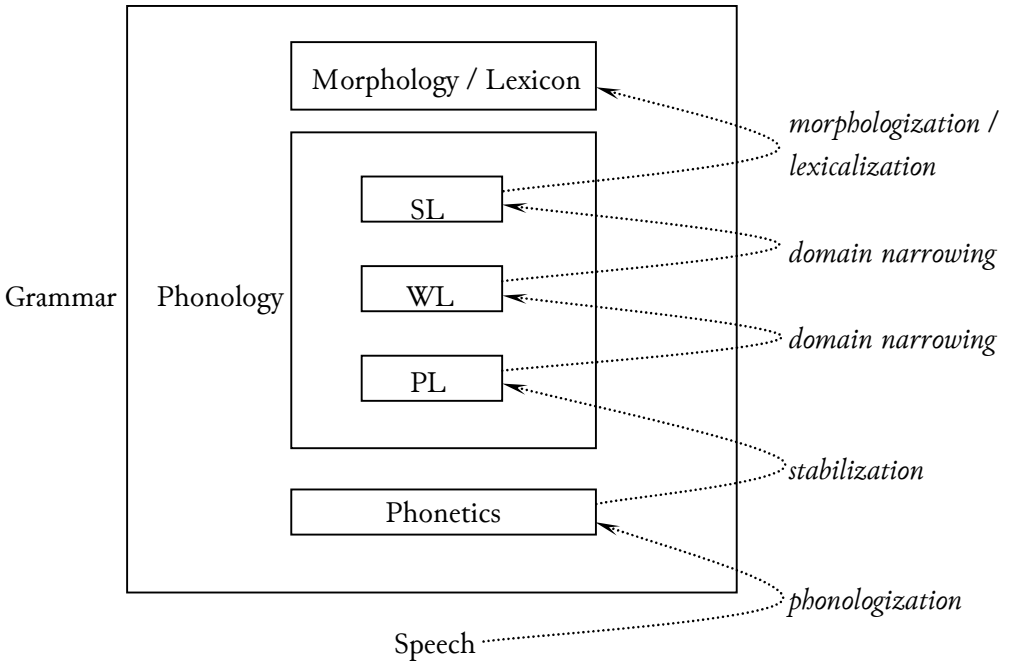
How did /t/-lenition and /l/-darkening become word-level?

§39 *Domain narrowing in the life cycle of phonological processes*

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 Bermúdez-Otero (2007a: 503-505), Bermúdez-Otero and Trousdale (2012: §2), and Bermúdez-Otero (2013).

§40



(Bermúdez-Otero and Trousdale 2012: 700)

§41 Prediction (Bermúdez-Otero and Trousdale 2012: 699, Bermúdez-Otero 2013: §3.2)

In a long-term lenition trajectory,

diachronically older process	↔	synchronically higher stratum (narrower domain)
diachronically younger process	↔	synchronically lower stratum (wider domain)

§42 • /ɹ/-lenition trajectory

ɹ $>_{\text{lenition}}$ ɻ $>_{\text{deletion}}$ ∅

/ɹ/-lenition is older than /ɹ/-deletion.

• /l/-lenition trajectory:

l $>_{\text{darkening}}$ ɫ $>_{\text{vocalization}}$ ʊ̈ ($>_{\text{deletion}}$ ∅)

/l/-darkening is older than /l/-vocalization.

∴ /ɹ/-lenition, /l/-darkening: older ⇨ higher stratum (narrower domain)
/ɹ/-deletion, /l/-vocalization: younger ⇨ lower stratum (wider domain)

§43 The prediction proves correct!

• Word-level processes (overapply to word-final Cs):

/ɹ/-lenition	does apply in *car alarm*	§21
/l/-darkening	does apply in *seal it*	§23
/t/-lenition	does apply in *hit Ann*	§27

• Phrase-level processes (do **not** overapply to word-final Cs):

/ɹ/-deletion	does **not** apply in *car alarm*	§20
/l/-vocalization	does **not** apply in *seal it*	§22

How did /t/-lenition become foot-based?

§44 *Rule generalization (Bermúdez-Otero 2013: §3.1)*

- An old idea: Schuchardt's (1885: 22) *innere Erweiterung der Lautgesetze*
  'internal expansion of the sound laws'.

- Rule generalization occurs when a sound change…
  …first applies in a very narrowly defined, highly phonetically favourable environment, then progressively extends to more inclusive phonological contexts.

  E.g. the Old High German consonant shift

	ˈV__V	ˈV__$_{\omega}$]	ˈV__	ˈVC$^{[+son]}$__	ˈVC__V	[$_{\omega}$ˈ__V
stage 1	✓					
stage 2	✓	✓				
stage 3	✓	✓	✓			
stage 4	✓	✓	✓	✓		
stage 5	✓	✓	✓	✓	✓	
stage 6	✓	✓	✓	✓	✓	✓
	*o**pf**an* 'open'	*gri**pf*** 'grasp'	*slā**pf**an* 'sleep'	*dor**pf*** 'village'	*scep**ph**en* 'create'	***pf**lëgan* 'care for'

  See Vennemann (1972: 186) for other examples.

- This pattern of generalization is often reflected in dialect geography in a way that is transparently captured by the wave model of sound change (Schmidt 1872):

  Sound changes originate in a 'focal' geographical area (Hock 1991: 440) and spread progressively outwards. In the focal area, the change is active for the longest time, and so eventually reaches its most generalized form. In the outermost areas, it may never progress beyond its original, most narrowly defined and phonetically favourable, phonological environment. This is Schuchardt's (1885: 22) *räumliche Projection zeitlicher Unterschiede* 'spatial projection of temporal differences'.

§45 Patterns of rule generalization define phonological scales (markedness hierarchies):

$$*\begin{bmatrix}\text{-son}\\ \text{-cont}\\ \text{-lax}\end{bmatrix} / \_\_\,\sigma] \quad \gg \quad *\begin{bmatrix}\text{-son}\\ \text{-cont}\\ \text{-lax}\end{bmatrix} / [_{\Sigma}\ldots\acute{V}\ldots\_\_\ldots]$$

§46 The dialectal signature of rule generalization:

- In the SP dialect, stop lenition applies in weak positions in the foot, $[_{\Sigma}\ldots\acute{V}\ldots\_\_\ldots]$,
  whereas /l/-darkening is still confined to weak positions in the syllable, $\_\_\,\sigma]$

  However, there do exist other English dialects where /l/-darkening is more advanced, having become a foot-based 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 /ɹ/-loss in codas,
  and
  Southern US dialects with /ɹ/-loss outside foot-initial onsets (Harris 2006: 4).

  See §20 above.

Conclusion

English consonantal allophony, including the syllabically ambiguous behaviour of word-final prevocalic consonants, is the result of diachronic patterns of

- rule generalization

and

- domain narrowing.

To understand these patterns, we need two separate synchronic hierarchies:

- a hierarchy of prosodic spans

and

- a hierarchy of cyclic domains.

A full understanding of English syllabification, as of any other language-particular phenomenon, must be an amphichronic understanding.

REFERENCES

Bermúdez-Otero, Ricardo (2007a). 'Diachronic phonology', in Paul de Lacy (ed.), *The Cambridge handbook of phonology*. Cambridge: Cambridge University Press, 497-517.

— (2007b). 'Word-final prevocalic consonants in English: representation vs derivation'. Paper given at the Old World Conference in Phonology 4, Rhodes, 20 January 2007. Handout available at http://www.bermudez-otero.com/OCP4.pdf.

— (2011). 'Cyclicity', in Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume, and Keren Rice (eds), *The Blackwell companion to phonology* (vol. 4: *Phonological interfaces*). Malden, MA: Wiley-Blackwell, 2019-48.

— (2013). 'Amphichronic explanation and the life cycle of phonological processes', in Patrick Honeybone and Joseph C. Salmons (eds), *The Oxford handbook of historical phonology*. Oxford: Oxford University Press. Available at http://ling.auf.net/lingbuzz/001679.

Bermúdez-Otero, Ricardo and Graeme Trousdale (2012). 'Cycles and continua: on unidirectionality and gradualness in language change', in Terttu Nevalainen and Elizabeth Closs Traugott (eds), *The Oxford handbook of the history of English*. New York: Oxford University Press, 691-720.

Browman, Catherine P. and Louis Goldstein (1995). 'Gestural syllable position effects in American English', in Fredericka Bell-Berti and Lawrence J. Raphael (eds), *Producing speech: contemporary issues. For Katherine Safford Harris*. New York: American Institute of Physics, 19-33.

Campbell, Fiona, Bryan Gick, Ian Wilson, and Eric Vatikiotis-Bateson (2010). 'Spatial and temporal properties of gestures in North American English /r/', *Language and Speech* 53 (1): 49-69.

Carter, Paul and John Local (2003). 'Modelling sound change in the liquid system in Tyneside English', *Proceedings of the International Congress of Phonetic Sciences* 15: 1193-96.

— (2007). 'F2 variation in Newcastle and Leeds English liquid systems', *Journal of the International Phonetic Association* 37 (2): 183-99.

Clements, G. N. (1991). 'Place of articulation in consonants and vowels: a unified theory', *Working Papers of the Cornell Phonetics Laboratory* 5: 77-123.

Cruttenden, Alan (ed.) (2001). *Gimson's pronunciation of English* (6th edn). London: Arnold.

Davis, Stuart and Mi-Hui Cho (2003). 'The distribution of aspirated stops and /h/ in American English and Korean: an alignment approach with typological implications', *Linguistics* 41 (4): 607-52.

Gick, Bryan (1999). 'A gesture-based account of intrusive consonants in English', *Phonology* 16 (1): 29-54.

— (2002). 'The American intrusive *l*', *American Speech* 77 (2): 167-83.

— (2003). 'Articulatory correlates of ambisyllabicity in English glides and liquids', in John Local, Richard Ogden, and Rosalind Temple (eds), *Phonetic interpretation: papers in laboratory phonology VI*. Cambridge: Cambridge University Press.

Gussenhoven, Carlos (1986). 'English plosive allophones and ambisyllabicity', *Gramma* 10 (119-141).

Harris, John (2003). 'Release the captive coda: the foot as a domain of phonetic interpretation', in John Local, Richard Ogden, and Rosalind Temple (eds), *Phonetic interpretation: papers in laboratory phonology VI*. Cambridge: Cambridge University Press, 103-29.

— (2006). 'Wide-domain *r*-effects in English', *UCL Working Papers in Linguistics* 18. Available at http://www.phon.ucl.ac.uk/publications/WPL/06papers/harris.pdf.

Hay, Jennifer and Margaret Maclagan (2010). 'Social and phonetic conditioners on the frequency and degree of 'intrusive /r/' in New Zealand English', in Dennis R. Preston and Nancy Niedzielski (eds), *A reader in sociophonetics*. Berlin: Mouton de Gruyter, 41-70.

Hayes, Bruce (2000). 'Gradient well-formedness in Optimality Theory', in Joost Dekkers, Frank van der Leeuw, and Jeroen van de Weijer (eds), *Optimality Theory: phonology, syntax, and acquisition*. Oxford: Oxford University Press, 88-120.

Hock, Hans Heinrich (1991). *Principles of historical linguistics* (2nd edn). Berlin: Mouton de Gruyter.

Kahn, Daniel (1976). *Syllable-based generalizations in English phonology*. Doctoral dissertation, MIT, Cambridge, MA.

Kiparsky, Paul (1979). 'Metrical structure assignment is cyclic', *Linguistic Inquiry* 10 (3): 421-41.

— (2006). 'The Amphichronic Program vs. Evolutionary Phonology', *Theoretical Linguistics* 32 (2): 217-36.

McCarthy, John J. (1993). 'A case of surface constraint violation', *Canadian Journal of Linguistics* 38 (2): 169-95.

Minkova, Donka (2003). *Alliteration and sound change in early English* (Cambridge Studies in Linguistics 101). Cambridge: Cambridge University Press.

Olive, Joseph P., Alice Greenwood, and John Coleman (1993). *Acoustics of American English speech: a dynamic approach*. New York: Springer Verlag.

Schmidt, Johannes (1872). *Die Verwandtschaftsverhältnisse der indogermanischen Sprachen*. Weimar: H. Böhlau.

Schuchardt, Hugo (1885). *Über die Lautgesetze: gegen die Junggrammatiker*. Berlin: Oppenheim. Available in English (1972), 'On sound laws: against the neogrammarians', in Theo Vennemann and Terence H. Wilbur (eds), *Schuchardt, the neogrammarians, and the transformational theory of phonological change: four essays*, Frankfurt am Main: Athenäum Verlag, 41-72.

Scobbie, James M. and Alan A. Wrench (2003). 'An articulatory investigation of word final /l/ and /l/-sandhi in three dialects of English', *Proceedings of the International Congress of Phonetic Sciences* 15: 1871-74.

Sproat, Richard and Osamu Fujimura (1993). 'Allophonic variation in English /l/ and its implications for phonetic implementation', *Journal of Phonetics* 21: 291-311.

Tuinman, Annelie, Holger Mitterer, and Anne Cutler (2007). 'Speakers differentiate English intrusive and onset /r/, but L2 listeners do not', in Jürgen Trouvain and William J. Barry (eds), *Proceedings of the 16th International Congress of Phonetic Sciences (ICPhS 2007)*. Dudweiler: Pirrot, 1905-08.

Vennemann, Theo (1972). 'Phonetic analogy and conceptual analogy', in Theo Vennemann and Terence H. Wilbur (eds), *Schuchardt, the neogrammarians, and the transformational theory of phonological change: four essays*. Frankfurt am Main: Athenäum Verlag, 181-204.

Wells, J. C. (1990). 'Syllabification and allophony', in Susan Ramsaran (ed.), *Studies in the pronunciation of English: a commemorative volume in honour of A.C. Gimson*. London: Routledge, 76-86.

— (2008). *Longman pronunciation dictionary* (3rd edn). Harlow: Longman.

CONTACT DETAILS

Ricardo Bermúdez-Otero
Linguistics and English Language
University of Manchester
Manchester M13 9PL
United Kingdom

r.bermudez-otero@manchester.ac.uk
www.bermudez-otero.com