

The allophony of English /aɪ/ reconsidered

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OVERVIEW

§1 /aɪ/-allophony in English: the received view

- In many English dialects, notably including Canadian English, /aɪ/ exhibits allophonic behaviour like the following:

$$/aɪ/ \rightarrow \begin{cases} [aɪ] & \text{e.g. } \textit{sigh, sign, dive, side} \\ [\Delta i] & \text{e.g. } \textit{life, sight} \end{cases}$$

- The received view of this allophonic pattern is that it reflects the application of a context-sensitive process of /aɪ/-raising triggered by voiceless obstruents:

$aɪ \rightarrow \Delta i$ / __[-voice] under certain prosodic conditions

E.g. Chambers (1973: 116, 1989: 79), Joos (1942: 141), Paradis (1980), among countless others.

- In this view, the overapplication of raising before flapped /t/ in words like *writer* and *title* involves a counterbleeding interaction between raising and flapping (e.g. Halle 1962):

	/ɹaɪdɪɹ/	/ɹaɪtɪɹ/	/aɪdəl/	/taɪtəl/
raising	—	ɹaɪtɪɹ	—	tɹaɪtəl
flapping	ɹaɪɹɪ	ɹaɪɹɪ	aɪɹəl	tɹaɪɹəl

§2 Empirical challenges to the received view

Recent research into /aɪ/-allophony raises three problems for the received view:

- /aɪ/-raising overapplies before /t/-flaps in most English dialects (possibly all; cf. §5 below). This is unexpected if transparency is the unmarked state of affairs.
- There are records of /aɪ/-raising overapplying before /t/-flaps even at an early gradient stage. Given that flapping is categorical, this is unexpected in modular feedforward frameworks where phonology serially precedes phonetics.
- In some dialects, /aɪ/-raising overapplies before /t/-flaps even though it is younger than flapping. This is unexpected in the light of the life cycle of phonological processes, according to which new sound patterns enter the grammar as transparent processes of phonetic implementation.

§3 *The solution: the enhancement-of-clipping hypothesis*

The puzzles in §2 disappear once we properly understand the relationship between /aɪ/-raising and prefortis clipping, the process that shortens English vowels before voiceless obstruents.

- Prefortis clipping is a categorical phonological process applying at the stem level.
- Clipping overapplies before /t/-flaps because it is stem-level, whereas flapping is phrase-level.
- /aɪ/-allophony starts its life cycle as a gradient process of offglide peripheralization that provides an additional acoustic cue to clipping.
- Hence, /aɪ/-raising is a transparent context-free process applying to categorically clipped tokens of /aɪ/, and not an opaque context-sensitive process; it is only clipping that is opaque and context-sensitive.

This analysis is consistent with

- (i) modular feedforward architectures,
- (ii) phonological stratification,
- and (iii) the life cycle of phonological process.

§4 *Supporting evidence*

This analysis correctly predicts the following facts:

- (i) /aɪ/-raising is sensitive to the categorical status of its target as clipped or unclipped, not to gradient duration;
- (ii) the distribution of raised [aɪ] is wider in Scottish dialects, where the Scottish Vowel Length Rule clips /aɪ/ before all consonants other than voiced continuants.

PROBLEMS FOR THE RECEIVED VIEW OF /aɪ/-RAISING

/aɪ/-raising overapplies before /t/-flaps in most, possibly all, English dialects

§5 *Dialect B?*

- Joos (1942: 143-144):

dialect A *write* [ɹaɪt] ~ *writer* [ɹaɪrɪ]

dialect B *write* [ɹaɪt] ~ *writer* [ɹaɪrɪ] (allegedly extant among Ontario schoolchildren)

Further reports in Rudes (1976) and, indirectly, Picard (1977).

Picked up as an argument for extrinsic rule ordering by Halle (1962), subsequently echoed in Chomsky & Halle (1968: 342), Bromberger & Halle (1989: 58-60), and Kenstowicz (1994: 6-7), among others.

- But it is highly unlikely that dialect B ever existed in Ontario, *pace* Joos.
 Chambers (1973: 122): no dialect-B speakers in the 1970s.
 Kaye (1990): if there had ever been any, they all without exception either
 (a) underwent lifespan change in adulthood
 or (b) died before the age of 50.
 Both (a) and (b) are incredible (on the rarity of lifespan change, see Fruehwald 2017a).
- Berkson *et al.* (2017), Davis *et al.* (2017):
 acoustic documentation of young speakers in Fort Wayne, Indiana, pronouncing /aɪ/ with
 a raised nucleus in *write*,
 but not in *ride*, *riding*, and—crucially—*writing*.
 But it is as yet unclear whether this is indeed an instance of dialect B: see the Appendix below
 (§37–§41) for discussion (and cf. also Fruehwald 2017b).

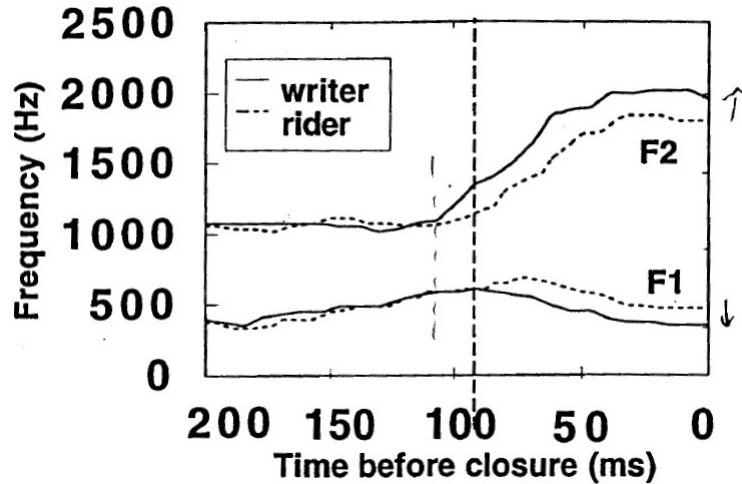
§6 *No diachronic explanation for the extreme rarity (possibly total absence) of transparent dialects*

- If transparency is the unmarked state of affairs
 because opaque interactions are hard to learn (Kiparsky 1971: 632; cf. Baković 2011)
 then the virtual absence of transparent dialects like ‘dialect B’ is unexpected.
- Possible diachronic explanation:
 there are no transparent dialects because...
 in all dialects, /aɪ/-allophony is chronologically older than /t/-flapping
 and there simply has been no reanalysis of opaque surface forms.
- Counterexample: Philadelphia English (Fruehwald 2013) see §9–§11 below.

/aɪ/-raising overapplies before /t/-flaps even in its incipient, phonetically gradient stage

§7 *Gradient offglide peripheralization before flapped /t/*

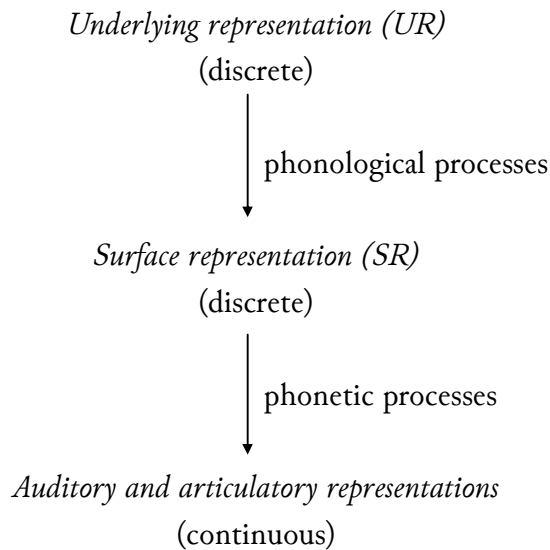
- The phonetic precursor of nucleus raising is offglide peripheralization:
 i.e. [ɹaɪt] >peripheralization [ɹaɪt] >raising [ɹaɪt]
 See Thomas (1991, 2000), Moreton (2004), Gussenhoven (2007), Moreton & Thomas (2007).
- Offglide peripheralization is highly pervasive: all dialects investigated show it to some degree.
 See Kwong & Stevens (1999), Thomas (1991: §4; 2000), Moreton (2004).
- Offglide peripheralization has been observed applying before flapped /t/,
 even in dialects where the nucleus has not yet been affected by raising,
 and where peripheralization remains a small, apparently gradient effect.



Time-normalized F1 and F2 trajectories for /aɪ/ in *writer* and *rider* uttered by a college-age American male. Note identical nuclei but peripheralized offglide in *writer*. (Kwong & Stevens 1999: 8)

§8 *A puzzle for classical modular feedforward architectures*

- In such architectures, phonology serially precedes phonetics:



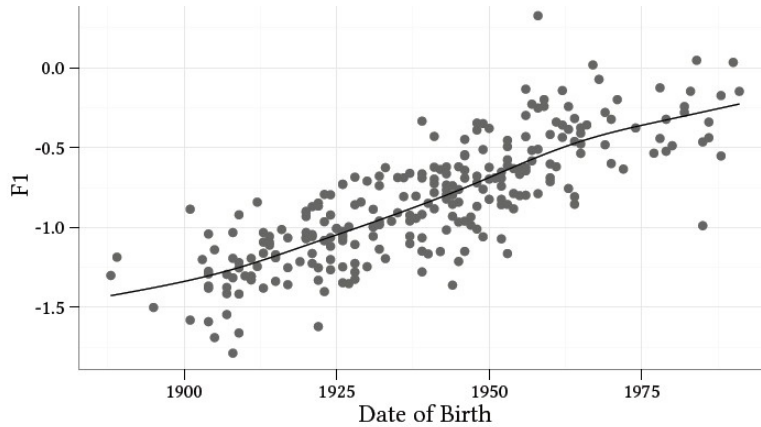
See Pierrehumbert (2002: 101-2), Bermúdez-Otero (2007: 502, 2015: §2.1), Bermúdez-Otero & Trousdale (2012: 693), among others.

- Hence, a gradient phonetic process like offglide peripheralization should never be made opaque by a categorical phonological process.
- Yet /t/-flapping is demonstrably categorical (Herd, Jongman & Sereno 2010).

/aɪ/-raising overapplies before /t/-flaps even in dialects where raising is younger than flapping

§9 */aɪ/-raising is a recent innovation in Philadelphia* (Fruehwald 2013)

- Implemented in a phonetically gradient fashion during the 20th century:

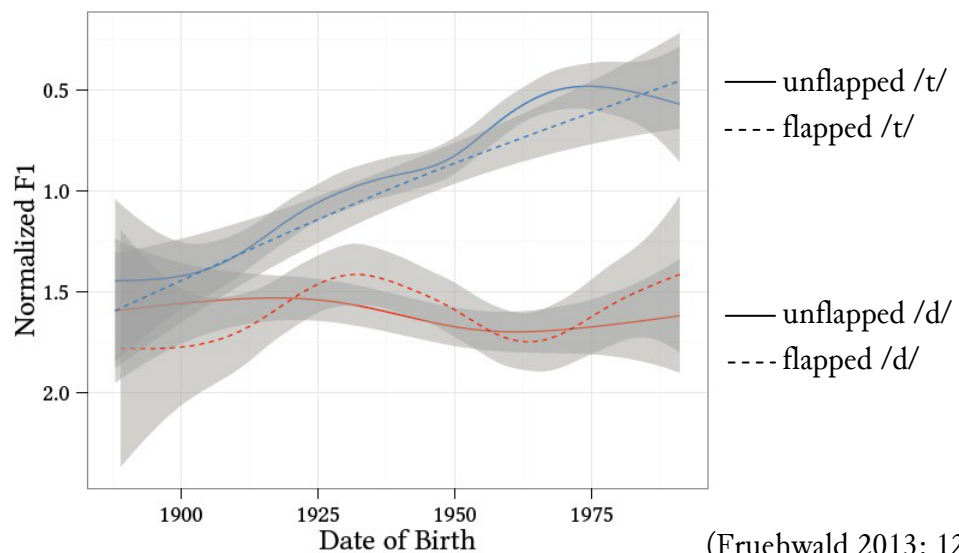


(Fruehwald 2013: 34)

- Data from the Philadelphia Neighbourhood Corpus (Labov & Rosenfelder 2013):
dots represent an individual speaker’s mean F1 for the nucleus of /aɪ/ in canonical raising environments (see §23–§25 below).
- In other environments, nucleus F1 remains roughly flat: see e.g. Fruehwald (2013: 112).

§10 */aɪ/ raised before flapped /t/, but not before flapped /d/, as in virtually all dialects*

/d/-flap	▶ no raising	{ <i>rider</i> /ɹaɪd-əɪ/ → [ɹaɪɹəɪ] <i>idle</i> /aɪdəl/ → [aɪɹəl]
/t/-flap	▶ raising	



(Fruehwald 2013: 121)

§11 *In Philadelphia, /t,d/-flapping is chronologically older than /aɪ/-raising*

- /t,d/-flapping already active before the inception of /aɪ/-raising:
i.e. [ɾ] in both *utter* and *udder* already in the 19th century.
- Puzzling diachronic evolution:

	<i>rider</i>	<i>writer</i>	<i>idle</i>	<i>title</i>
1900	[ɾaɪɾəɾ]	[ɾaɪɾəɾ]	[aɪɾəl]	[taɪɾəl]
2000	[ɾaɪɾəɾ]	[ɾaɪɾəɾ]	[aɪɾəl]	[taɪɾəl]

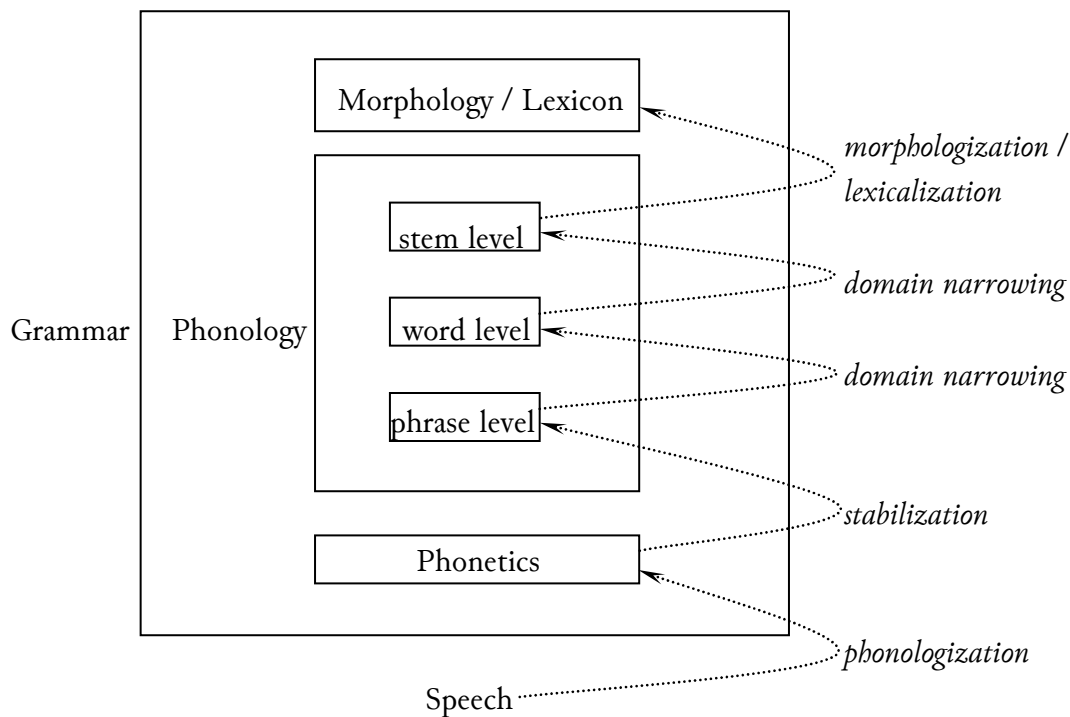
§12 *More dialects like Philadelphia*

Raised [aɪ] before flapped /t/ in dialects where /aɪ/-raising is a mid or late 20th century innovation:

- 3 informants in Rochester (upstate New York) in 1975 (Vance 1987: 202)
- 30 natives of Ann Arbor (Michigan) in 1995 (Dailey-O’Cain 1997: 110-11)

Neither upstate New York nor Michigan had raising in the 19th century (Thomas 1991: §2-§3).

§13 *A puzzle for the life cycle of phonological processes*



(Bermúdez-Otero & Trousdale 2012: 700)

- New sound patterns enter the grammar from below, as gradient processes of phonetic implementation (phonologization).
- These new processes apply transparently across the board.
They cannot be born opaque because they are not directly inserted in the middle of the grammar: there is no change by ‘rule insertion’ (King 1973, Gress-Wright 2011, Roberts 2011).
- Opacity emerges through aging, as older processes undergo stabilization and domain narrowing, and younger processes enter the grammar from below.

See e.g. Kiparsky (1988, 1995), Bermúdez-Otero (2007: 503ff; 2015), Bermúdez-Otero & Trousdale (2012: §2), Ramsammy (2015).

Summary: the new puzzle of /aɪ/-raising and /t/-flapping

§14

In most—possibly all—English dialects that have /t,d/-flapping and /aɪ/-allophony apparently conditioned by consonant voicing, /aɪ/ followed by a /t/-flap behaves like /aɪ/ followed by a voiceless obstruent, regardless of whether /aɪ/-allophony is young or old in the dialect, or whether /aɪ/-allophony is gradient or categorical.

THE SOLUTION: /aɪ/-RAISING TARGETS CATEGORICALLY CLIPPED ALLOPHONES

Key ideas

- §15 Prefortis clipping... • is categorical,
• applies at the stem level,
• is therefore counterbled by phrase-level /t/-flapping in dialects that have the latter.
- §16 /aɪ/-raising... • is a context-free process targeting categorically clipped allophones of /aɪ/,
• is therefore transparent (it is clipping that is opaque),
• starts out as a gradient enhancement of clipping, though it can be stabilized later (as happened already long ago in Ontario).

§17 Therefore, the correct statement of /aɪ/-raising, at least in its incipient stages, is

not aɪ → ai / __[-voice] under certain prosodic conditions (context-sensitive)

but ǣɪ → ǣi (context-free)

§18 Derivations in early 20th-century Philadelphia:

		<i>rider</i>	<i>writer</i>	<i>idle</i>	<i>title</i>
Stem level	(clipping)	ɹaɪd	ɹǣɪt	aɪdəl	tǣɪtəl
Word level		ɹaɪdəɹ	ɹǣɪtəɹ	aɪdəl	tǣɪtəl
Phrase level	(flapping)	ɹaɪrəɹ	ɹǣɪrəɹ	aɪrəl	tǣɪrəl
Phonetics	(raising)	ɹaɪrəɹ	ɹǣɪrəɹ	aɪrəl	tǣɪrəl

The relative order of processes...

- was fully determined by their stratal affiliation,
- unproblematically reflected the sequence of corresponding historical innovations.

Prefortis clipping is categorical

§19 *A long-standing question*

“[W]hat is the status of vowel length before voiced sounds in English, *bead* [bi:d] versus *beat* [bit]? The difference is greater than observed in many other languages (Keating 1985), but does it count as phonological?”

(Cohn 2006: 26)

For discussion of the general approach to categoricity and gradience I adopt here, see Bermúdez-Otero & Trousdale (2012: 694-96) and Strycharczuk (2012: 45-7).

§20 *Key points*

- The magnitude of the durational difference between clipped and unclipped allophones in English is extreme
(Chen 1970; see Sóskuthy 2013: 196-99 for a review of later literature).
- Prefortis clipping suffices to cue the laryngeal contrast by itself
(Denes 1955, Klatt 1976, Port & Dalby 1982, among many others).
- Prefortis clipping is itself not sensitive to the magnitude of other phonetic cues to the laryngeal contrast:
crucially, in English dialects with anticipatory assimilation in voicing/voicelessness, vowel duration remains unaffected by assimilation (Jansen 2004: 142).

§21 *If prefortis clipping is categorical, how is it represented in the phonology?*

- A simple proposal:
- voiceless obstruents share the skeletal unit of the preceding vocoid;
 - skeletal attachments iconically reflect durational trade-offs.

<i>bid</i>	<i>bit</i>	<i>bead</i>	<i>beat</i>	<i>bide</i>	<i>bite</i>
X X	X X	X X X	X X X	X X X	X X X
		∨	∨		
ɪ d	ĩ t	i: d	iː t	a ɪ d	ǎ ɪ t

On durational trade-offs in prefortis clipping, see Kluender *et al.* (1988).

On ‘mora sharing’, see Maddieson (1993), Maddieson & Ladefoged (1993), Hubbard (1995a,b), and Broselow *et al.* (1997).

A similar application of mora sharing to the analysis of Canadian raising has been independently proposed by Onosson (2014).

Prefortis clipping and /aɪ/-raising are found in exactly identical environments

§22 *The evidence of Canadian English*

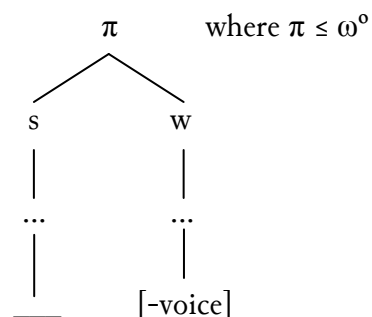
Canadian data are particularly valuable because the environment of /aɪ/-raising in places like Philadelphia is very similar to the environment of Canadian raising,

but Canadian raising is...

- exhaustively described
- categorical
- old already established in the late 19th century;
- sociolinguistically stable no significant difference in application between the 1970s and today, aside from variation in respect of fronting of the nucleus; remarkably uniform application across Canada.

See e.g. Chambers (1973, 1989, 2006), Chambers & Hardwick (1986), Rosenfelder (2007), Thomas (1991).

§23 *The prosodic environment of Canadian raising*



- Raising is triggered by a following voiceless consonant (C_0):

e.g. *write* [ɹaɪt] cf. *ride* [ɹaɪd]
knife [nlaɪf] cf. *knives* [nlaɪvz]

- Raising does not apply across prosodic word boundaries (ω):

e.g. *high school* [ω' [ω 'hɑɪ] [ω ,sku:l]] cf. *univerbated* [ω 'hlaɪ,sku:l]
tie shop [ω' [ω 'taɪ] [ω ,ʃɑp]]

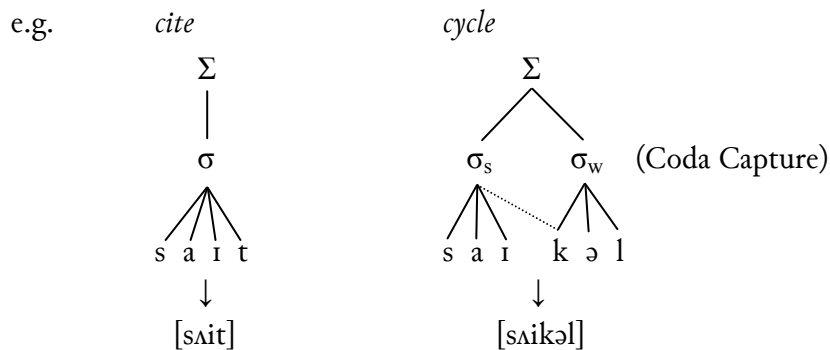
Idsardi (2006: 26) reports that, in his idiolect, raised [laɪ] is acceptable in *Don't lie to me*. I have been unable to find another Canadian speaker who concurs with this introspective judgment.

- Within ω^0 , the trigger C_0 must be in a weak branch of the lowest prosodic node dominating both trigger and target:

i.e.	in the coda	<i>cite</i>	[saɪt]
	in the a onset of a following weak syllable	<i>cycle</i>	['saɪ.kəl]
	in the onset of a following weaker foot	<i>nitrate</i>	[ω [Σ 'nlaɪ] [Σ ,tɹeɪt]]
but not	in the onset of a following stronger foot	<i>citation</i>	[ω [Σ ,saɪ] [Σ 'tɹeɪʃən]]

§24 *Excursus: against the ambisyllabic analysis*

- Paradis (1980) and Chambers (1989: §2) propose that raising is triggered by a tautosyllabic C_0 .
 Key assumption: ambisyllabicity à la Kahn (1976).



- This analysis incurs a fatal paradox:
 - (i) In the dialect described by Chambers, raising applies to *nitràte* [nlaɪtɹeɪt].
 Therefore, the /t/ of *nitràte* must be ambisyllabic.
 Therefore, secondary stress on the following syllable must not block Coda Capture.
 - (ii) If secondary stress on the following syllable does not block Coda Capture, then intervocalic /t/ is ambisyllabic in words like *phòtòn* [foutən].
 But, in the Kahnian approach to English syllabification, intervocalic /t/ flaps if ambisyllabic.
 Therefore, the ambisyllabic approach to Canadian raising predicts that the /t/ of *phòtòn* flaps.

☞ This prediction is incorrect: the /t/ of *phòtòn* never flaps.

§25 *Canadian raising underapplies before word-level suffixes* (Bermúdez-Otero 2003)

E.g. *eye-ful* [ˈaɪfʊl], *[ˈaɪfʊl] cf. *Eiffel* [ˈaɪfəl]
Frau-ship [ˈfɹaʊʃɪp], *[ˈfɹaʊʃɪp]

∴ The conditions of application for Canadian raising are determined at the stem level.

- Not an effect of secondary stress on the affix: cf. *nítràte* [ˈnɪ,tɹɛɪt].
- Not an effect of an ω-boundary between stem and affix: see Bermúdez-Otero (2011: §4).
 Cf. e.g. Szpyra (1989: 178-200), Hammond (1999: 322-329), Raffelsiefen (2005).
- For the absence of cyclic reapplication, see Bermúdez-Otero (2012: 31-40).

§26 *The environment of prefortis clipping: the testimony of Wells (1990, 2008)*

Instrumental studies of the effects of secondary stress and word-level suffixation on prefortis clipping are sadly lacking.

However, through the syllabification conventions of the *Longman pronunciation dictionary*, Wells (1990, 2008) reports (presumably introspective) judgements on the incidence of prefortis clipping.

Strikingly, as first observed by Bermúdez-Otero (2004: §21),

the environment of prefortis clipping as reported by Wells

is exactly identical with

the environment of Canadian raising as reported by Chambers (see §23-§25)!

- | | | | |
|------------------|---|--------------------|-----------------|
| • Clipping... | before coda ʧ | <i>cite</i> | [sɑɪt] |
| | before onset ʧ in an unstressed σ | <i>cycle</i> | [ˈsɑɪ.kəl] |
| | before onset ʧ in a weaker stressed σ | <i>nítràte</i> | [ˈnɑɪ.tɹɛɪt] |
| • No clipping... | before onset ʧ in a stronger stressed σ | <i>cítation</i> | [.saɪ.ˈtɛɪ.ʃən] |
| | across ω-boundaries | <i>hígh schòol</i> | [ˈhaɪ.ˌsku:l] |
| | before word-level suffixes | <i>éyeful</i> | [ˈaɪ.fʊl] |
| | | but <i>Éiffel</i> | [ˈäɪ.fəl] |

∴ Prefortis clipping is stem-level.

(See §25.)

Stem-level clipping is counterbled by phrase-level flapping

§27 I assume Kiparsky's (1979: 437) analysis of flapping (see also Jensen 2000):

i.e.

- at the word level, obstruents become [lax] if not foot-initial
- at the phrase level, lax [t] or [d] flap between in the environment {V,ɹ}__V

hit Ann

/hɪt/

hɪt^[lax]

hɪɾæn

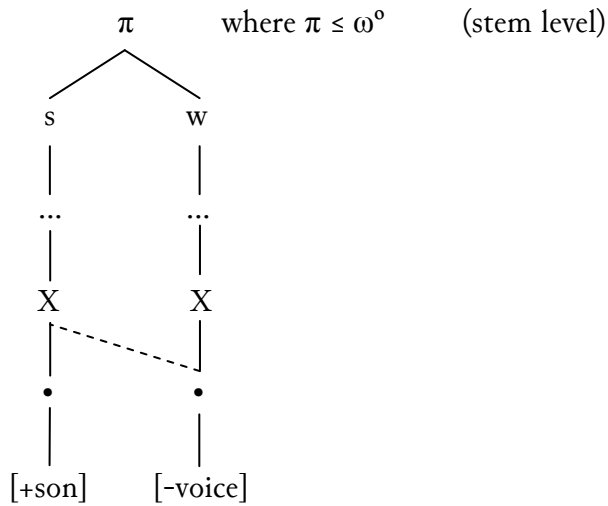
Flapping must be phrase-level because its domain straddles word boundaries.

See e.g. Kaisse & Shaw (1985: 4), among many others.

∴ Stem-level clipping applies before phrase-level flapping.

Descriptive summary

§28 *Prefortis clipping*



/aɪ/-raising

ǎɪ → ǎi

CORROBORATING EVIDENCE

/aɪ/-allophony is sensitive to allophonic categories, not to continuous duration

§29 *The incomplete neutralization of the clipped/unclipped distinction before flaps*

Median duration (ms) of /aɪ/ in Philadelphia (Fruehwald 2013: 117)

unflapped /d/ (e.g. <i>ride</i>)	237	unflapped /t/ (e.g. <i>write</i>)	144
flapped /d/ (e.g. <i>rider</i>)	156	flapped /t/ (e.g. <i>writer</i>)	111

§30 *Analysis*

- */aɪ/ is longer in rider than in writer.*

∴ The two vowels have different representations in the output of the phonology:

- categorically unclipped [aɪ] in *rider*,
- categorically clipped [ǎɪ] in *writer*.

This effect has been replicated in a large number of studies (Fox & Terbeek 1977, Zue & Laferriere 1979, Patterson & Connine 2001, Herd, Jongman & Sereno 2010).

It is observable both in real words and in nonce items (Braver 2014).

- /aɪ/ is longer in *ride* than in *rider*, and in *write* than in *writer*.

∴ There is a gradient phonetic process that reduces the duration of all vowels before flaps, without categorically neutralizing the clipped/unclipped distinction.

An old observation: “The real point is that vowels before flaps become shortened to some fraction of their original length” (Fox & Terbeek 1977: 33).

For a recent formal implementation, see Braver (2013: 149).

§31 *The phonetic origins of /aɪ/-allophony: an enhancement of clipping*

- Nucleus raising is a knock-on effect of offglide peripheralization (see refs in §7).
- In turn, offglide peripheralization is an enhancement of clipping (Gussenhoven 2007):
 - ↳ learners observe that a peripheralized offglide creates a percept of reduced nucleus duration;
 - ↳ learners reanalyse offglide peripheralization as an acoustic cue realizing a clipped target.

§32 *Correct prediction 1*

Offglide peripheralization and nucleus raising are acoustic cues to a clipped category, and **not** coarticulatory effects.

∴ /aɪ/-allophony tracks the categorical status of a vowel as clipped or unclipped, and **not** its duration.

	<i>writer</i> <i>write</i>	<i>rider</i>	<i>ride</i>
raising tracks.....surface category	[ǎɪ] [ǎɪ]	[aɪ]	[aɪ]
not duration	111ms 144ms	156ms	237ms

This answers a question raised in Fruehwald (2013, 2016).

/aɪ/-raising in Scottish English: the Scottish Vowel Length Rule

§33 *The Scottish Vowel Length Rule (SVLR)*

In Scottish English, /aɪ/, among other vowels, is...

- clipped before all consonants other than voiced continuants e.g. *sign, side, life, sight*
- unclipped elsewhere e.g. *sigh, dive*

On the SVLR, see e.g. Aitken (1981), Agutter (1988), McMahon (1991), etc.

Note that the SVLR is categorical and stem-level, like prefortis clipping in my analysis.

§34 *Correct prediction 2: the SVLR and /aɪ/-raising*

If raising targets clipped tokens of /aɪ/,
 then, in Scottish English, raising will target tokens of /aɪ/ clipped by the SVLR
even when such tokens are followed by a voiced consonant.

This is correct (Scobbie *et al.* 1999: 241)!

- [ɹ̥i] clipped by the SVLR and so raised: *sign* (cf. CanEng!)
side (cf. CanEng!)
life
sight
- [ae] unclipped by the SVLR and so unraised: *lie*
alive

§35 *A unified explanation for /aɪ/-allophony across all English dialects*

	<i>alive</i>	<i>line</i>	<i>light</i>
❶ /aɪ/-raising in Scotland	[aɪ]	[ɹ̥i]	[ɹ̥i]
❷ /aɪ/-raising in Canada, Philadelphia, etc.	[aɪ]	[aɪ]	[ɹ̥i]
❸ /aɪ/-monophthongization in Southeastern US	[a:]	[a:]	[ɹ̥i]

Relatively peripheralized offglides enhance clipping by

prefortis clipping	⇒	❷, ❸
the SVLR	⇒	❶

Cf. the spread-of-facilitation hypothesis of Moreton (2004: 29) and Moreton & Thomas (2007), which fails to predict the Scottish pattern.

CONCLUSION

§36 At first glance, the interaction between /aɪ/-allophony and /t/-flapping across English dialects appears to challenge both the life cycle of phonological processes (§13) and classical modular feedforward architectures of grammar (§8).

However, the hypothesis that /aɪ/-allophony originates as an enhancement of categorical distinctions created by clipping effectively answers those challenges, while correctly predicting

- (i) the independence of /aɪ/-allophony from gradient duration
- and (ii) the difference in the distribution of raised allophones between Scottish English and other dialects.

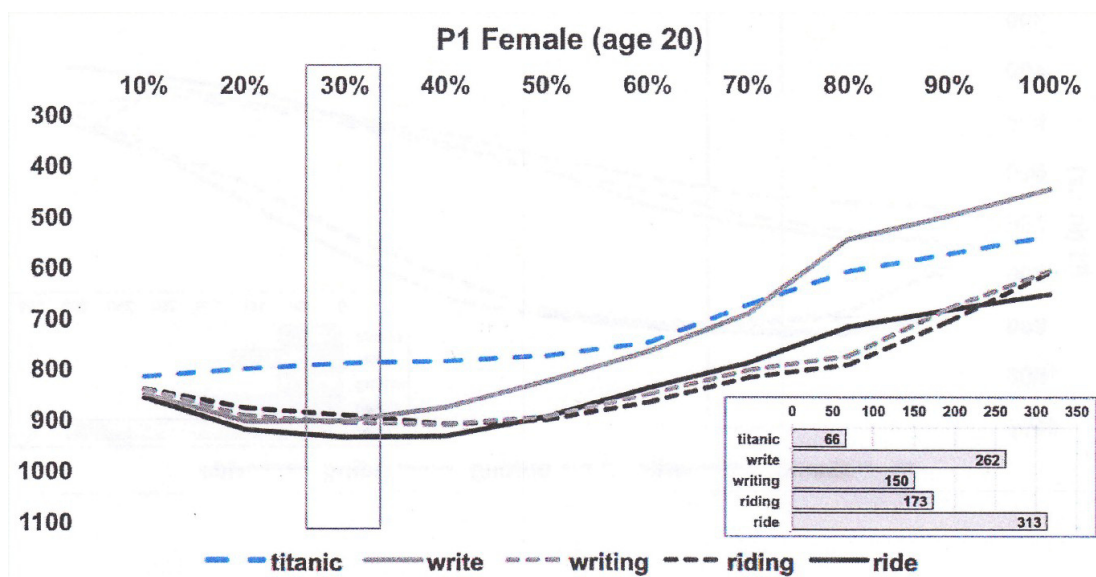
The evidence of /aɪ/-allophony in English is thus consistent with phonological frameworks where,

- (i) diachronically, new sound patterns enter the grammar from below as transparent processes of gradient phonetic implementation;
 - (ii) synchronically, phonology serially precedes phonetics;
- and (iii) synchronically, phonological processes with narrow morphosyntactic domains serially precede phonological processes with wide morphosyntactic domains.

APPENDIX: WHAT IS HAPPENING IN FORT WAYNE?

Davis *et al.* (2017: 6) pattern 1

§37



§38 Discussion:

- (i) *Write* shows clear offglide peripheralization in comparison to *ride*, as per §7 above.
- (ii) In contrast, the offglides of *writing* and *riding* are nearly identical. This is unlike the pattern documented by Kwong & Stevens (1999).
 - Hypothesis 1: Offglide peripheralization is triggered by phonetically voiceless segments and so does not apply before flapped /t/.
 - Hypothesis 2: Offglide peripheralization has undergone incrementation only in monosyllables, where the durational contrast between clipped and unclipped /aɪ/ is maximal.

To discriminate between hypotheses 1 and 2, we need data on the behaviour of the offglides in pairs of disyllables like *viper* ~ *fiber* and *biker* ~ *tiger*.

(iii) The nucleus of *titánic* exhibits low F1, even though this is not a raising environment in the canonical Canadian pattern (cf. §23).

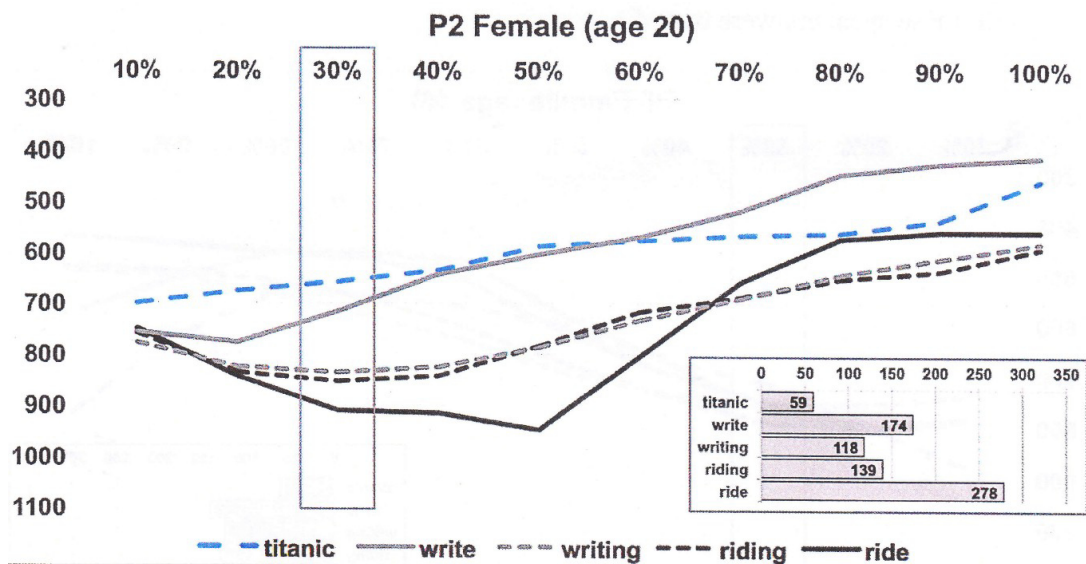
- Hypothesis 1: Raising before phonetically voiceless segments begins in the environments where /aɪ/ has the smallest duration, and is only later reanalysed as metrically controlled.
- Hypothesis 2: *Titanic* does not show canonical /aɪ/-raising, which spreads from the offglide (§7), but rather exhibits simple articulatory undershoot.

Hypothesis 2 is supported by the absence of offglide peripheralization in *titanic*: the overall F1 trajectory is very flat compared with the steep rise in *write*.

To discriminate between hypotheses 1 and 2, we need data on overall F1 trajectories in pairs like *tripártite* ~ *tribúnal*, *titánic* ~ *didáctic*, and *icónic* ~ *gigántic*.

Davis *et al.* (2017: 5) pattern 2

§39



§40 Discussion:

Pattern 2 is identical with Pattern 1, except that the nucleus of *write* is now raised.

- Hypothesis 1: This is an example of dialect B, except that raising is not yet under metrical control.
- Hypothesis 2: This is the precursor of a normal type-A dialect, except that raising is still confined to monosyllabic feet; *titánic* just shows F1 undershoot, not raising.

Hypothesis 2 is supported by two observations:

- (i) More advanced Fort Wayne speakers have a type-A dialect (Davis *et al.*'s pattern 3).
- (ii) There are anecdotal reports of other dialects with voicing-conditioned /aɪ/-allophony in monosyllables but not in longer words (Chambers 2006: 110 on Saginaw, Michigan).

Again, to decide between hypotheses 1 and 2 on empirical grounds, we need data from pairs like *viper* ~ *fiber*, *biker* ~ *tiger*, *tripártite* ~ *tribúnal*, *titánic* ~ *didáctic*, and *icónic* ~ *gigántic* (see §38).

Fort Wayne: the current state of play

§41 Berkson *et al.* (2017) and Davis *et al.* (2017) have indeed observed an incipient stage of /aɪ/-raising.

At present, it is too early to tell whether this incipient stage involves

- a dialect of the hitherto unobserved type B, (hypothesis 1)
- or • normal type-A raising, but still confined to monosyllables (hypothesis 2).

My money is on the second option, but the issue remains open.

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