

Canadian Raising, Opacity and Rephonemicization

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In this article I offer a small contribution to the surprisingly long-lived debate on the “raised” diphthongs of Canadian English. I will argue that recent efforts by Mielke, Armstrong and Hume 2003 to revive Joos's 1942 phonemic splitting analysis and to deny the existence of allophonic opacity are incorrect, and I will offer some new evidence from active alternations which also exhibit typical “poverty of the stimulus” characteristics (Chomsky 1980: 34).

Joos 1942 describes the basic pattern of raised diphthongs before voiceless consonants leading to the familiar alternations in (1).

- (1) a. *knife* [nɪɪf] *knives* [naɪvz]
b. *house_{Noun}* [hʌʊs] *houses* [hauzəz] *house_{Verb}* [hauz]

I will use IPA [ɪɪ] and [ʌʊ] to transcribe the “raised” diphthongs and [aɪ] and [aʊ] to transcribe the “unraised” diphthongs, even though there is considerable variation in the exact quality of the starting position of the diphthongs, both raised and unraised (as, indeed, there is also considerable variation in the presence of actual vocal fold vibration in the phonetic implementation of [z] in words such as [hauz], see Smith 1997). In quoting other authors I will use the transcriptions from the original sources. There is now a growing industry in the phonetic measurement of the raised diphthongs, see, for example Thomas 2001, Moreton and Thomas 2004 and Currie Hall 2005. While it is obviously important to nail down the exact phonetic correlates of raising, I believe we need to resist the lure of the transcription systems.

Writing [ɔɪ] for the raised diphthong is mostly a simple convenience. We do not necessarily intend to identify the raised diphthong with the monophthong [ɔ], nor does writing [aɪ] and [aʊ] for the unraised diphthongs commit us to a particular position on the frontness of the starting position of the diphthongs relative to [a] and [æ], which also varies considerably. That is, while the raised diphthong may approach [ɔ] in either or both of F1 and F2, there is no commitment to an identification of the diphthong with the monophthong. For example, we do not expect whatever phonetic drift may occur with [ɔ] to be automatically transferred to the raised diphthongs. It is sufficient for the raised diphthongs to simply have reliably different pronunciations, of whatever quality or quantity. It is very likely that the perception of a raised diphthong depends on a number of factors, including formant values, overall length of the diphthong, the relative length of the nuclear and glide components and the dynamics of the formant movements. Thus, for example, we can, at least for my speech, induce a non-raised perception in *about* by doubling each pitch period, effectively doubling the length of the vowel components, slowing the formant velocities and altering the durations of the nuclear and glide components with a simple time-domain transformation. The importance of Canadian Raising for opacity comes from its interaction with the process that neutralizes the /t-d/ contrast (or the neutralization of the /s-z/ contrast between *house_{Noun}* and *house_{Verb}* by “phonetic” devoicing), not from the phonetic details of the raising process itself.

Joos (1942: 81) goes on to describe two dialects of Canadian English, A and B, which differ in their pronunciation of the word “typewriter”:

(2) “Now such speakers divide into two groups according to their pronunciations of words

like *typewriter*. Group A says [tɛɪprɛɪdə] while Group B says [tɛɪpraɪdə]. Each group has its own problems.”

More accurately, each group poses its own problems for the strict phonemic theory advocated by Joos, which includes the principle of *biuniqueness*. Biuniqueness requires that every phone be assigned to one and only one phoneme; that is, phonemes could not overlap in their pronunciations (see Bloch 1941). For Joos, the [d] in *typewriter*, therefore, must be assigned to the *phoneme* /d/, and therefore the pronunciations of *write* and *writer* must be related to one another morpho-phonemically. That is, the relation between the [t] of *write* and the [d] of *writer* is also a relation between /t/ and /d/, for no [d] can ever be assigned to /t/ as [d] is already assigned to /d/ (which would then cause /t/ to overlap with /d/), and the /t~/d/ alternation must be handled as a morpho-phonemic relation. Famously, it is the biuniqueness requirement that generative phonology rejected (Chomsky 1957, Halle 1959: 21-24; see Dresher 2005 for an excellent review). Joos then argues (1942: 81) that the preservation of the raised diphthong before the voiced /t/ therefore forces new phonemes into the language:

- (3) “Before /d/, Group A has four diphthong phonemes for two in the older language; it distinguishes *writer* from *rider*, *clouting* from *clouding* by the choice of diphthong alone. ... [I]n hundreds of common words like *bet*, *betting* there is also a difference in the vowels accompanying the inflectional shift from /t/ to /d/, so that *betting* = *bedding* in all its phonemes. This difference [in the patterning of vowel and diphthong pronunciations between *bite*=*biting*≠*biding* and *bet*≠*betting*=*bedding* WJI] clearly establishes the phonemic splitting of the diphthongs, for if *betting* has the vowel

articulation of *bet*, not that of *bed* or *bedding*, then the special vowel-articulation in *betting* would be a feature of [i.e. a property associated with WJI] the phoneme /t/, and the diphthongs would not have been phonemically split either.”

The opacity of the pronunciation of *writer* with the raised diphthong preceding the surface voiced stop [d] (or flap [D]/[ɾ], see below) was the dilemma; Joos's solution is to phonemically split the diphthongs, and to give *write* a raised diphthong phonemically: /rʌɪt/, changing the alternation from a phonemic one to a morpho-phonemic one.

Joos's phonemic splitting solution was *not* adopted by all linguists at the time, however (Dresher 1981: 92-93 makes this same point in his critique of Natural Generative Phonology, which anticipates Optimality Theory in its adherence to surface-true laws; see also Dresher 2005 and Vance 1987: 203). Harris (1951: 70 -71) argues from considerations of symmetry of environments that there is no phonemic splitting:

- (4) “This criterion [of symmetry of environments WJI] may be used in complicated cases, e.g. ones involving overlapping. Thus in some dialects the alveolar flap consonant of *writer* is identical with that of *rider*. The preceding vowel qualities, however, differ, so that we have, in terms of segments, [ræyr¹ɾ] and [rayr¹ɾ]. Before all segments other than [r¹] the [æy] and [ay] are complementary: [æy] before voiceless consonants, [ay] before voiced segments, as in [fæyt] *fight*, [pæynt] *pint*, [maynd] *mind*. We have here two distributional irregularities. First [æy] occurs only before voiceless sounds, including [r¹], while [ay] occurs only before voiced sounds and [r¹]. [Footnote omitted WJI] Nowhere else in English do we have phonemes with just such a distribution, nor is it

elegant to have two phonemes which are complementary through so much of their distribution. Second, if we include [r¹] in /t/, then /t/ will have general distribution, but /d/ will not occur in /'V_V/. Our alternative, following the criterion above, is to phonemicize the whole sequence [æyr¹] as /ayt/ and [ayr¹] as /ayd/: /raytər/ *writer*, /raydər/ *rider*. [Footnote omitted WJI] The segment [r¹] is then a member of /t/ when it occurs after [æy], and of /d/ when after [ay]; [æy] is the member of /ay/ occurring before voiceless phonemes. The distribution of /ay/ is now quite like that of /oy/, etc., and the distribution of /t, d/ like that of /p, b/, etc. [Footnote omitted WJI]”

There is thus a latent “two-level” model for Harris: the statement “[æy] is the member of /ay/ occurring before voiceless *phonemes*” [emphasis added WJI] in referring to *phonemes* avoids the issue of which *allophones* implement the phonemes in the surface pronunciation. That is, for Harris the use of [æy] is conditioned by the *phonemic* environment, not the phonetic environment. The logical extension of this distinction was and is rule-ordering, as famously analyzed for Canadian Raising by Chomsky 1957: 347, Halle 1962: 386, Chomsky 1964: 73-74 and Chomsky and Halle 1968: 342. Chomsky (1957: 347) argues:

(5) “A weaker condition on the relation between phonemic representation and phonetic qualities would allow a much simpler and more natural solution. Irrespective of the *writer-rider* opposition, the rules of English grammar that convert sequences of phonemes into sequences of phones will have to contain the following:

(5) a. Vowels are automatically lengthened before voiced consonants. b. Medial, post-stress /t/ and /d/ become [D].

If we give /ráydir/ as the phonemic transcription of *rider* and /ráytir/ as the phonemic transcription of *writer*, rules (5a-b), applied in the given order, will automatically yield the correct phone sequences [rá'yDir], [ráyDir]. We can accordingly dispense with the heavily restricted phoneme /a'/'...

Thus, to Harris's criterion of symmetry of environments, Chomsky adds the considerations of rule generality and independent motivations for the processes.

Chambers 1975: 89-90 explicitly gives the derivations for the two dialects for “writer” and “rider”, repeated here in (6).

(6)	Dialect A	/raytʃr/	/raydʃr/	Dialect B	/raytʃr/	/raydʃr/
	Raising	rɔytʃr	-----	Voicing	raydʃr	(vacuous)
	Voicing	rɔydʃr	(vacuous)	Raising	-----	-----
		[rɔydʃr]	[raydʃr]		[raydʃr]	[raydʃr]
		(opaque)				

As Chambers explains, Dialect A maintains a distinction in surface pronunciation through the opaque application of Raising, whose environment is obscured by the later application of Voicing.

Mielke, Armstrong and Hume 2003, trying to reconcile the opaque interaction of processes with Optimality Theory (Prince and Smolensky 2004, etc.) see the matter differently, however: it “can be described transparently” (p. 130) by phonemicizing the raised diphthong: “outputs such as *riding/writing* show the 'opaque' vowel quality forms a minimal contrast in the language.” (p. 131) This marks a return to Joos's view of more than 60 years ago, and is thus

subject to all the criticisms voiced by Harris and Chomsky. For Mielke, Armstrong and Hume, as for Joos, alternations such as those in (1) are then lexically listed as morphological relics, parallel to the fricative voicing also displayed in (1). That is, following the dictates of Lexicon Optimization, the concept KNIFE then has two allomorphs, /nɪɪf/ and /naɪv/. Mielke, Armstrong and Hume further claim that Raising is becoming more limited and less productive, for instance Bermudez-Otero 2003 contrasts *Eiffel* [ɪɪ] with *eyeful* [aɪ]. I think such cases are better explained by residual secondary stress on the suffix *-ful*; such stress does in some cases block raising, as noted by Chambers 1975: 94, and further discussed in Vance 1987, Chambers 1989 and Dailey-O'Cain 1997.

The Mielke, Armstrong and Hume account relies crucially on the non-existence of any active phonological alternations involving Raising, which would necessitate high-ranked constraints barring [aɪ] before [-voice], and which would disallow forms like that for *eyeful*. However, productive alternations *do* exist, at least for some speakers, even though they are somewhat difficult to construct given English morphology. Unproductive morphology, such as the voiceless plural ending [-s] produces at least one relevant case: [daɪ] *die* versus [dɪɪs] *dice*. Semi-productive stem-readjustment morphology, such as the change from /d/ to /s/ before *-ive* also produces a few cases: [dəsɑɪd] *decide* versus [dəsɪɪsəv] *decisive* (also *derisive* and *divisive*). One productive example is the ordinal suffix *-th*, as in *ninth* [nɪɪnθ] which is pronounced with raising for me and the small pool of informants I consulted (all born in Elgin County in Southwestern Ontario between 1930 and 1970). Raising before nasal clusters is also exhibited in Harris's transcriptions, see (4) above with [pæyɪnt] *pint* but [məyɪnd] *mind*, and

Dailey-O'Cain 1997: 110-111 who found Raising 50% of the time overall for her subjects in words like *pint* (but, noticeably, none in words like *count*). The raising before nasal clusters might again be used to argue for rule ordering (nasalization followed by nasal deletion followed by raising); my own opinion is that the nasals are syllabified into the syllable nucleus, and the raising is conditioned by a voiceless coda (see Paradis 1980 and Chambers 1989 for discussion of the formulation of the raising rule with syllabic constituents). This formulation sidesteps the ordering issue with nasalization. Of course analysts predisposed to allomorphic listing could argue from cases such as *three/third* and *five/fifth* that small ordinals (such as *ninth*) are often morphologically irregular and thus lexically listed. However, productive use of *-th* can be found in mathematical contexts when referring to an arbitrary element within a sequence. Phrases such as “the i^{th} element” (more than 28,000 hits on Google in May 2005) or even “the y^{th} element” (about 30 hits on Google in May 2005) are commonplace in computer science texts. The pronunciations of these words *do* exhibit raising for me and the informants I consulted: $[\text{ɪ}\theta]$ i^{th} and $[\text{w}\text{ɪ}\theta]$ y^{th} . Some referees for this article, however, suggest that other speakers may not have raising in these cases; obviously further investigation of this question would be very helpful. Moreover, clearly words such as i^{th} and y^{th} do not form part of the “primary linguistic experience” of the child, forming a classic poverty of the stimulus argument, for how is the learner to know that these items will be pronounced with a raised diphthong if they are never encountered in conversation during the relevant period for language acquisition. The argument would be even stronger for speakers with raising in i^{th} and y^{th} but without raising in nasal clusters, such as *pint* or *ninth*; unfortunately, my informants all

have raising in *pint* and *ninth*, so I have not found speakers with that pattern. One reviewer (noting the lack of raising in words like *count*) suggests that the raising in words like *pint* is a phenomenon separate from Canadian Raising *per se*; if true, this would again strengthen the argument presented here, as then there would be no morphological model for the forms in *-th* with raising.

A similar argument can be constructed from the two “sub-dialects” of Pig Latin reported by Chomsky and Halle (1968: 343). In one Pig Latin sub-dialect, *ice* is distinguished from *sigh* in vowel quality: [ʌiseɪ] versus [aiseɪ] respectively; in the other sub-dialect they are both pronounced with raising: [ʌiseɪ] (for Pig Latin speakers with appended *-weɪ* for vowel-initial words, compare the Pig Latin forms for words such as *pipe* and *pie*, for me these are [ʌɪpeɪ] and [aɪpeɪ] respectively). Both sub-dialects are easily handled with rule ordering, but it is not possible to insightfully handle both using re-phonemicization and surface-true generalizations.

Further opaque cases involving phrasal degemination can also be constructed employing /d-t/ sequences. In my own speech (and I have Raising before certain enclitic prepositional forms such as *to* and *for*; see McCarthy 1993: 173-176 for discussion of similar cliticization issues with linking and intrusive *r*) I have the relevant contrast between the sentences in (7a,b) when spoken in a casual style at a conversational rate.

- (7) a. He lied to me. [hilaɪrəmi]
 b. Don't lie to me. [dɔ̃lɪrəmi]
 c. Don't lie about me. [dɔ̃laɪbʌʔmi]

The past tense *-d* prevents the application of raising in (7a) but this is subsequently merged with the following /t/, ultimately pronounced as a flap. When the *-d* is not present, raising does occur, (7b). Such syntactic constructions cannot be handled by Mielke, Armstrong and Hume, and they are not compatible with more general claims such as those of Green (2004: 1):

- (8) “The results suggest the possibility that *all* cross-linguistic instances of apparent opacity can be explained in terms of the phonology-morphology interface and that purely phonological opacity does not exist. If this claim is true, then parallelist OT can be defended against its detractors without the need for additional mechanisms like sympathy theory and stratal OT.”

The difference between (7b) and (7c) is syntactic (the choice of an adjunct prepositional phrase), not morphological, and therefore cannot be handled by the phonology-morphology interface, nor by lexical listing of allomorphs. In conclusion, cases like *ith* and those in (7) demonstrate conclusively that Canadian Raising is alive and well and still opaque, just as Jack Chambers documented 30 years ago.

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