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OPTIMALITY THEORETIC ANALYSIS OF NON-RHOTICITY IN ENGLISH[1]

Abstract:
The paper intends to describe various rhotic phenomena within a unified phonological framework of Optimality Theory. This description encompasses "standard" rhotic phenomena, such as linking and intrusive *r*. Additionally both hyper- and hypo-rhoticity are discussed. The paper serves primarily two points. First, it proves practical workability of constraint mechanism, as proposed by Optimality Theory. Second, it presents an integrated account of seemingly unrelated phonological facts observed in various accents of English.

The paper discusses also previous accounts of rhoticity in English in connection with an attempt of presenting solid evidence for the choice of underlying forms. Furthermore two competing theoretical descriptions of rhotic insertions (epenthesis vs. gliding/spreading) are compared and evaluated. Finally, the spreading account is shown to be formally superior to the anti-hiatus approach.

Moreover, the paper demonstrates a way in which *r*-liaison might be incorporated in the synchronic grammar of non-rhotic accents. Simply put, *r*-liaison could be perceived as another instantiation of VSPREAD conspiracy, where vowels tend to spread their melodic content onto the following segments. The OT machinery was also employed to account for the differences between various subtypes of non-rhotic accents, in terms of re-ranking of several constraints. The peculiar phenomena of hyper-rhoticity have, too, been demonstrated to fit the proposal.

Keywords: Phonology, Optimality Theory, Rhoticity, Accents of English, Hiatus

1. Introduction

In this paper, for intelligibility of presentation, I will first assemble and summarize various types of evidence pointing clearly to the fact that historically rhotic and non-rhotic forms are not underlyingly distinct in non-rhotic accents of English. Subsequently, by virtue of presented evidence it will be argued that the

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[1] This paper is primarily based on chapters 3 and 5 of *Ostalski* (2004), where both the formal mechanism of Optimality Theory and rhotic variations are discussed in greater detail.

non-distinct underlying forms are non-rhotic. As a final point, I will present an optimality-theoretic analysis of *r*-liaison, where /r/ is shown to be inserted/ spread in a non-arbitrary fashion.

Thus, the line of reasoning will be as follows: if there is no underlying contrast between *near* and *idea*, then *near*=*idea* as /-ɪə/ or as /-ɪər/. If, based on evidence, *near*=*idea* as /-ɪə/, then /r/ is inserted in both *beer is* and *idea is*. All that needs to be proven at this point is the fact that the actual choice of /r/ rather than /t/ or /ʔ/ is not arbitrary. Conceivably, there are two ways of proving this fact. *R*-insertion could be perceived as an effectuation of hiatus-prevention in the form of second-best glide (where both /w/ and /j/ are impossible) - anti-hiatus approach. Alternatively, *r*-insertion could be treated as spreading of some feature(s) present in the preceding vowel onto the following melodic sequences. This spreading is, then, literally spelled out as /r/ only if it fills out an empty onset (provided by vowel-initial strings). Both of these approaches will be presented and compared.

2. Combined evidence for the underlying merger of historically rhotic and non-rhotic forms in non-rhotic accents
(eight reasons why *beer* always rhymes with *idea*)

Below we will present (most essential) pieces of evidence in favor of one underlying form for historically (domain-final) rhotic and non-rhotic classes of words in non-rhotic accents of English, thus obviating any need for the combined insertion/deletion approach. Comments will be added in due places, otherwise we will let the evidence speak for itself (in the quotations below and elsewhere in this paper slashes denote what traditionally is known as broad phonemic transcription not necessarily underlying representations).

1) McCarthy, who explicitly defends the existence of a contrast between rhotic and non-rhotic forms, admits nevertheless, “no internal evidence of the kind available to language learners would justify an underlying distinction between *spa* and *spar*, which are homophones in all contexts” (1991: 194).

2) Trudgill (1983, pp: 148-9) comments:

British pop singers often insert non-prevocalic /r/s where they do not belong. [...] Phonologists must find it interesting, however, that, in spite of the sure guide that orthography provides, mistakes do occur - strong counterevidence to the claim that all *r*-less accents have underlying /r/ plus an *r*-deletion rule. Clearly, speakers who make mistakes of this type do not have underlying /r/. ([...] in some cases hyper-American /r/s are repeated again and again in the course of the same song.) Examples of complete lack of success in analyzing the model accent correctly include: [...] *a bachelor boy* /ər bætʃələr bɔɪ/, [...] *Ma and Pa* /maːr ən paːr/, [...] *saw them* /sɔːr ðɛm/.

3) Trudgill (1989, pp: 15-6) provides additional comments:

One of my informants, resident in the USA for ten years, was consistent in pronouncing /r/ only in the words *for, where, here,* and *are,* and with a couple of very rare exceptions pronounced non-prevocalic /r/ nowhere else, not even in *aren't*. It seems, then, that /r/, though apparently salient, is not readily accommodated to. [...] I can certainly attest that if I want to pronounce, say, *part* as /paːrt/ I find it very hard to do so in the flow of conversation [...].

4) Wells (1982: 33) remarks:

If I want to play the part of an American, a British audience will on the whole be quite satisfied with pronunciations such as [dɔrn] for *dawn* or [ˈsoʊfər] for *sofa*: this is what many British people believe Americans say [...].

and additionally (Wells 1982: 114-5):

Experience shows, however, that it is very difficult for a Londoner, for example, to avoid using absurd pronunciations like [dɔrn], [aɪˈdɪər] when imitating an American or Scottish accent. When personally attempting this feat, I find that constant vigilance is called for (and I am fortunate enough to be a good speller).

5) Wells (1982: 507) provides also examples of various hyper-rhotic pronunciations:

Pronunciation such as *idea* /aɪˈdɪər/, *law* /lɔər/ may also occur for another reason, namely through inaccurate attempts at restoring the statusful historical /r/ [...] such pronunciations are naturally likely to arise through the application of an *R*-Insertion rule after any /ɪə, ɛə, ɑə, ɔə, ʊə, ɜ, ə/ indiscriminately. There are no statistics on the frequency of occurrence of forms of this type in New York, but they certainly occur. So (occasionally) do cases such as *cob* /kɑərb/, for the same reason.

and additionally Wells (1982: 522):

Not surprisingly, *R*-restoration leads to a number of unhistorical instances of /r/. Not only did one-third of Parslow's informants have /r/ in *law*, some of them had it in *dog* and *cough* too, no doubt by analogy with words such as *wharf* [...].

6) Assuming that /r/ is underlyingly present in *beer*, just as it is in *red*, and that /r/ is underlyingly absent in *idea*, we should expect to find a phonetic difference between the quality of an inserted and underlying /r/. This phonetic distinction, however, is not attested. What is found, on the other hand, is a potential acoustic difference between linking/intrusive /r/ and lexical /r/ (see below).

7) It will be recalled that McCarthy (1991, 1993) attributes quite a different behavior of lexical and function words with respect to *r*-liaison to (amongst other things) an underlying contrast between rhotic and non-rhotic forms. The very existence of such a consistently different behavior, however, is questionable, as the following shows (Wells 1982: 227):

> [...] accents which allow the /jə/ form prevocalically naturally tend, if non-rhotic, to insert /r/ after it; hence pronunciations such as [jəɹ ˈɑ̃ːʔ] *you aren't, I'll tell you how* [jəɹ ˈæː]. [...]. In such cases, in fact, weakened *you* and *your* become homophonous, whatever the environment. *To*, too, has /tə/ as one of its weak forms; parallel considerations lead RP /tʊ ˈiːt/ or /tuː ˈiːt/ to compete with not only [tə ˈʔiːt] but also a popular /təɹ ˈiːt/. The contractions sometimes written *wanna, gotta, hafta, oughta, gonna* follow the same pattern [...]. The /v/-less form of *of* has a prevocalic alternant /ər/ [...]. So does the /v/-less form of weakened *have*, [...]; and *by* has a Norwich prevocalic weak form /bər/.

8) Finally, we might evoke the fallacy of panlectalism as a common premise on which most combined deletion/insertion accounts are based.

3. Combined evidence for the underlying non-rhoticity of historically rhotic and non-rhotic forms in non-rhotic accents
(seven reasons why *beer* always rhymes with *idea* as /-ɪə/)

Below I will present (most fundamental) types of substantiation in favor of one non-rhotic underlying form for historically (domain-final) rhotic and non-rhotic classes of words in non-rhotic accents of English, thus proving the need for the insertion (and not deletion) approach (in point of fact, some of the evidence introduced in 1.2 above may also serve the same purpose). Comments will be added in appropriate places, otherwise I will, yet again, let the evidence speak for itself.

1) An [r] deletion account, it is argued by McCarthy, is wrong because it does not explain the extension of 'intrusive' [r] to new words and other languages as in (McCarthy 1991: 195): *Francois[r] is coming*, *rumba[r]ing*, *subpoena[r]ing*, *guffaw[r]ing*, *baah[r]ing] of sheep*, *blah[r]er* 'more mediocre', *schwa[r] epenthesis*, *The Beqaa[r] in Lebanon*, (the following examples from Jespersen (1909)): Danish *lukke[r] op*, German *hatte[r] ich*, *sagte[r] er* or as in: (Wells 1982: 226): *ich bin jar*/r/ *auch fertig*, *tio estas interesa*/r/ *ideo, viva*/r/ *España, gloria*/r/ *in excelsis*, *Fontainebleu abatement* [-blɜːr ə-], *Degas* /ˈdeɪgɑːr/ *and, Dada*/r/*ism, the junta*/r/ *in Chile, as far as BUPA*/r/ *is concerned, UEFA*/r/ *officials*.

2) Some speakers apparently have *r*-liaison blocked if the immediately preceding consonant is /r/ as in *an area of agreement, put my tiara on, the Victoria Embankment, a diarrhea attack, gonorrhea and syphilis, the emperor of Japan* (after Wells: 1982). In a deletion account, an extra rule for deletion in a prevocalic environment would have to be invented, whereas in an insertion analysis, blocking of [r]-insertion by a higher-ranked phonotactic rule is possible.

3) Speech rate has an effect on [r]-linking. More rapid speech has more [r]s. If [r] is a hiatus breaker, this is to be expected: a hiatus will be perceived less quickly in slower speech. The assumption that deletion takes place less often in faster speech goes against most assumptions about elision rules.

4) In some non-rhotic accents, both /ʔ/ and /r/ are hiatus-fillers. [ʔ] is extended amongst careful speakers to those cases where there is a danger of an intrusive /r/ at a point of vowel hiatus, e.g. in *law and order, drama and music*; the glottal marker is in turn applied by some speakers (and in the teaching of singing) in cases where a regular linking /r/ is permissible, e.g. in *later on, far off, four aces*, but where some inhibition is imposed by the fact that the final vowel in the first word is /ə, ɑː/ or /ɔː/, i.e. those associated with intrusive /r/ sounds. This usage of [ʔ] has been observed by Cruttenden (1994: 261): "The focusing of attention on this particular type of analogous formation as an undesirable speech habit has led to the use by some speakers of a pause or glottal stop in such critical cases of vowel hiatus, with the result that, in avoiding 'intrusive' /r/'s, they have also abandoned justifiable linking /r/'s in favor of a vowel glide or glottal stop, e.g. in *secure it, I'm sure it does, War and Peace, winter evening*." and Wells (1982, pp: 284-5): "Perhaps the most striking example of this phenomenon concerns /r/ sandhi [...]. In native-speaker RP it is usual to use sandhi /r/ in the appropriate places, in the environments where it is 'intrusive' (unhistorical, not corresponding to the spelling) just as in those where it is not. But the speech-conscious tend to regard intrusive /r/ as incorrect, and hence attempt to avoid it. [...], the typical outcome is the suppression of most sandhi /r/'s. [...] Pronunciations which I should consider typical [...] are: *more and more* [ˈmɔːʔən(d) ˈmɔː], *Christina Onassis* [krɪˈstiːnə ʔəʊˈnæsɪs]. If an underlying /r/ is assumed to be present then there is no reason for the appearance of a glottal stop.

5) An additional problem with deletion analyses (as observed by Giegerich 1999) becomes obvious in the Lexical Phonology model he proposes. Word-internal 'intrusive' [r] (*drawing* [ˈdrɔːrɪŋ]) is stigmatized most strongly in RP (see Cruttenden 1994: 264), while 'intrusion' between words (*draw it* [ˈdrɔːrɪt]) is less frowned upon. There are speakers who are apparently able to make this distinction. This can be predicted by a model in which there is [r]-insertion: this would operate only post-lexically; speakers who do not make such a distinction would have the rule operate on level 2 of the lexical phonology as well. A model incorporating deletion would not get these results. It would have to assume a deletion in the lexical phonology, and a resurrection of underlying /r/ in the post-lexical stage (a similar Duke of York gambit (Pullum 1976) may be observed in McCarthy 1991, where some /r/'s are introduced only to be later deleted).

6) Another type of evidence comes from the alleged phonetic differences between lexical [r] and liaison-[r]. If it is assumed that both linking and intrusive *r*'s are the result of spreading, it can be shown to be like [j] or [w] glide formation, which is something different from the occurrence of the lexical phonemes [j] and [w] (see note 23). If [r]-liaison is like [j w]-liaison, that is spreading from a previous vowel to provide a (minimal) onset, it will be expected to show the same kind of relationship to lexical [r] in onsets. McCarthy (1993: 179) provides

the following examples showing the difference between lexical and liaison /r/: *I saw reels* [aɪ sɔː rɪəlz] vs. *I saw eels* [aɪ sɔː ʳɪəlz]; *the Shah records* [ðə ʃɑ rəˈkɔdz] vs. *The Shah accords* [ðə ʃɑ ʳəˈkɔdz]. In a spreading account of [r], the phonetic difference between these forms can be accounted for.

7) If /r/ is assumed to be present underlyingly in domain-final position, e.g. *bar*, one cannot help but extend the same assumption to other environments, e.g. *bark*. The problem is, then, that /r/ in *bark* never surfaces.

4. Intrusive [r] as the second-best epenthetic consonant in hiatus contexts. OT account

One of the two possible ways of showing that *r*-liaison is not synchronically arbitrary is by positing that [r] insertion occurs when glide insertion is blocked because [r] is the next most prominent segment which could be inserted. This approach, based on prominence scales, is defended by e.g. Uffmann (2002). Below we provide a description and analysis of such an approach.

It may be argued that glottal stops, contrary to glides[2], are found epenthetically in onsets of initial or stressed syllables, that is, in prominent positions, not to resolve hiatus but because this epenthesis is prominence-driven. Uffmann (2002) provides the following examples of glottal stop epenthesis in German:

(1) Orkan [ʔɔʀˈkaːn] '*hurricane*'
Kloake [kloˈʔaːkə] '*sewer*'
Oase [ʔoˈʔaːzə] '*oasis*'
Chaos [ˈkaɔs] '*chaos*'
chaotisch [kaˈʔoːtɪʃ] '*chaotic*'

The example of the pair *Chaos* vs. *chaotish*, proves that [ʔ]-epenthesis is not necessarily induced by hiatus. Glides, on the other hand, are typical hiatus

[2] A different approach to the issue of glottal stop insertion versus glide insertion is found in Rubach (2000). Rubach notes that some languages employ both strategies. In Czech, for example, we find both processes, glottal stop insertion word-initially and glide insertion intervocalically within the word. An input form /idiot/ '*idiot*' will surface as /ʔidijot/ in Czech. Rubach takes this as evidence for his theory of Derivational OT (DOT). He assumes two constraints both of which militate against one of the two types of insertion. The constraint *[constricted glottis] bans insertion of the glottal stop by banning insertion of the feature [constricted glottis]. On the other hand, there is the constraint *MULT-LINK, a constraint against feature spreading. As glide formation results from vocalic spreading, high-ranked *MULT-LINK will block glide formation. Rubach further suggests that the ranking of these two constraints with respect to each other changes from one level of derivation to the next, such that gliding will occur on one level (due to lower-ranked *MULT-LINK) and glottal stop epenthesis on the other (because *[constricted glottis] is outranked by *MULT-LINK).

breakers[3], occurring intervocalically in a large number of languages (e.g. English, Laver 1994, Cruttenden 1994; Czech, Polish, Rubach 2000). In addition, their featural content is determined by spreading from one of the two flanking vowels. [j] is commonly inserted in the context of a front vowel; [w] is inserted in the context of a back/round vowel. Furthermore, glides are generally considered to have the same featural make-up as vowels except for syllabicity and duration (see e.g. Catford 1988, Laver 1994 for the treatment of vowels and glides as '*vocoids*'). In both place and manner of articulation, glides are thus maximally similar to their vocalic environment. In other words, glides are minimally contrastive with their environment. This minimal contrastiveness is enhanced by a second factor: That the degree of phonetic realization may vary; glide insertion is optional in a number of languages; alternatively, the degree of gliding (in terms of duration) may vary. Glottal stop epenthesis hardly ever shows this amount of variability.

The epenthesis of glottal stops and glides may, therefore, be characterized as follows: Their insertion occurs in different contexts, for different reasons. The choice of the epenthetic consonant depends on its perceptual salience and on prominence contrast. Depending on the optimal degree of salience or contrast, different epenthesis strategies will be employed, such that glottal stops are inserted to maximize the contrast to the following vowel and thus the perceptual salience of the epenthetic segment, glides are inserted to minimize the contrast to the following or preceding vowel and thus the perceptual salience of the epenthetic segment. There is thus not one invariably optimal epenthetic consonant or one 'default' consonant in a language. Instead, the choice of the epenthetic consonant is determined by the environment in which epenthesis occurs and the drive to either maximize or minimize the perceptual salience of the epenthetic segment. Consequently, the constraints that are responsible for the selection of the epenthetic consonant cannot simply be universal (context-free) markedness constraints. Instead, these constraints have to be sensitive to the position where epenthesis occurs and to the relative prominence of the epenthetic segment.

[3] The problem with the view that epenthetic glides function only as hiatus-breakers is the fact that such glides are also found in non-hiatus environments (possibly to satisfy ONSET), e.g. Wakelin (1977, pp: 94-5) observes: "In the south-west the semi-vowels may be distributed differently from in RP. [...]" and mentions the addition of [w] in *old, boil, poison* and of [j] in *earn, earth* and *ear*. In addition, in Polish, in both traditional dialects (especially of central Poland) and generally in non-standard, thus not necessarily uneducated) urban varieties (referred to by Rubach, 2000 as *rural* speech) one finds *j*-preposing (*prejotacja*) and *w*-preposing (actually [ɯ]-preposing), as in *igła* 'needle' [ˈjiɡɯ̯ä], *oko* 'eye' /ˈwɔkɔ/, *ucho* 'ear' /ˈwuxɔ/. While in urban varieties *j*-preposing is much more frequent than *w*-preposing; in traditional dialects both are as frequent, and in fact *w*-less pronunciations are typically perceived as too posh in informal, everday contexts. The extension of *j*-preposing to other vowels aside from /i/, (e.g. /a, ɛ, u/ in *apteka, Ewa, uzda*; see Urbańczyk (1984: 29), however, must be considered a thing of the past.

Uffmann (2002) makes use of such context-sensitive constraints, using the theory of Prominence Alignment (Prince and Smolensky (1993), McCarthy and Prince (1995)).

Prince and Smolensky (1993) identify two different prominence scales (cf Jespersen (1904), who discovered the sonority scale), one with respect to the prominence of different syllable positions, one with respect to the prominence of the individual segment, where prominence is here defined as the sonority of a segment. The first scale distinguishes between peaks (typically nuclei) and margins (onsets, codas).

Syllabic prominence: Peak is more prominent than Margin

The second scale captures the prominence of individual segments (the sonority scale). It states that vowels are the most prominent segments, followed by approximants, laterals, nasals, obstruents and finally laryngeals.

Segmental prominence: Vowels > r > l > nasals > obstruents > laryngeals

It has also been suggested that the two scales be combined, thus yielding two sets of scalar markedness constraints, by aligning the members of both scales with respect to their relative prominence. Prominent segments align with prominent positions and vice versa. Peaks are thus preferably filled with prominent material (best: vowels); margins are preferably filled with non-prominent material (obstruents, laryngeals), as shown by the two markedness scales:

*Margin/V » *Margin/r » Margin/l » *Margin/nas » *Margin/obs » *Margin/lar

*Peak/lar » *Peak/obs » *Peak/nasal » *Peak/l » *Peak/r » *Peak/V

Using the prominence scales and two well-established constraints, the epenthesis of a glottal stop may be analyzed as below (after Uffmann 2002):

(2) German *Elch* ‘moose’

	/ɛlç/	ONSET	DEP	*MARGIN/V	*MARGIN/NAS	*MARGIN/OBS	*MARGIN/LAR
(a)	/ɛlç/	* !					
(b)	☞/ʔɛlç/		*				*
(c)	/tɛlç/		*			* !	
(d)	/nɛlç/		*		* !		
(e)	/jɛlç/		*	* !			

If ONSET is ranked above DEP, epenthesis will ensue, because satisfaction of the markedness constraint (have an onset) is more important than satisfaction of the faithfulness constraint (do not add material). This basic ranking does not determine, however, which segment is inserted. This is determined by the prominence-based markedness scale for margins (onsets being margins).

Having observed above that glides are inserted to minimize prominence contrast and to make the inserted element as similar to a vowel as possible, it seems necessary to argue that intervocalic consonants are not treated as margins rather as peaks (this is the actual assumption made by Uffmann). Therefore, a maximally prominent segment is optimal in intervocalic position. The tableau below, which assumes an abstract input /ia/, illustrates how insertion of a maximally sonorous segment now emerges as optimal. The basic ranking of ONSET and DEP remains the same: Epenthesis occurs for the same structural reason, namely the requirement for syllables to have onsets. However, the selection of the optimal epenthetic segment functions differently because the markedness scale for this context is the reverse of the scale from the previous tableau; intervocalically, prominence is maximized (and contrast is minimized) in epenthesis (assuming that intervocalic segments for nuclei).

(3) /ia/

	/ia/	ONSET	DEP	*MARGIN/LAR	*MARGIN/OBS	*MARGIN/NAS	*MARGIN/V
(a)	/ia/	* !					
(b)	/i?a/		*	* !			
(c)	/ita/		*		* !		
(d)	/ina/		*			* !	
(e)	☞/ija/		*				*

In consequence, the default strategy to avoid hiatus in English is glide insertion. The two constraints which determine whether epenthesis occurs in hiatus position or not are ONSET and DEP. In order to account for the observed variation (glide formation does not occur if the first vowel is not high), additional constraints are needed, however, constraints that militate against the types of spreading to a non-high glide – types of spreading that do not occur (in English). The prohibition against non-high glide formation may be captured by a constraint which bans non-high glides in English: *$G_{[-hi]}$ glides are [+high]. The second potential type of spreading (of a non-high vowel onto a high glide) is militated against by a constraint which prohibits the insertion of a feature [high] which is not present in the input: DEP(hi) The feature [high] as a correspondent in the input (no insertion of the feature [high]). DEP(hi) is not violated in (j-, w-) glide formation because the [+high] specification of the glide has not been inserted but has spread from the preceding vowel; spreading hence does not incur a violation of a faithfulness constraint. As violations of these two constraints DEP(hi) (non-high vowels do not spread to high glides) and *$G_{[-hi]}$ (there are no non-high glides) are not found in English, both constraints can be assumed to be undominated. In sum, *r*-liaison may be analyzed as in the tableau below:

(4) '*... law is ...*'

	/lɔː ɪz/	ONSET	*G$_{[-hi]}$	DEP(hi)	DEP	*V_V/LAR	*V_V/r	*V_V/V
(a)	/lɔːɪz/	* !						
(b)	/lɔːwɪz/			* !	*			*
(c)	/lɔːɰ̃ɪz/		* !		*			*
(d)	☞/lɔːrɪz/				*		*	
(e)	/lɔːʔɪz/				*	* !		*

5. Intrusive [r] as spreading. OT account

Before I present an OT analysis of *r*-liaison as spreading, I have to comment on the problems that accompany the hiatus approach described in the previous section.

First, glottal stops may be used to break hiatus contrary to predictions made by the *r* as anti-hiatus approach. For instance, in some non-rhotic accents, both /ʔ/ and /r/ are hiatus-fillers. [ʔ] is extended amongst careful speakers to those cases where there is a danger of an intrusive /r/ at a point of vowel hiatus, e.g. in *law and order*, *drama and music*; the glottal marker is in turn applied by some speakers (and in the teaching of singing) in cases where a regular linking /r/ is permissible, e.g. in *later on, far off, four aces*, but where some inhibition is imposed by the fact that the final vowel in the first word is /ə, ɑː/ or /ɔː/, i.e. those associated with intrusive /r/ sounds. This usage of [ʔ] has been observed by Cruttenden (1994: 261): "The focusing of attention on this particular type of analogous formation as an undesirable speech habit has led to the use by some speakers of a pause or glottal stop in such critical cases of vowel hiatus, with the result that, in avoiding 'intrusive' /r/'s, they have also abandoned justifiable linking /r/'s in favor of a vowel glide or glottal stop, e.g. in *secure it, I'm sure it does, War and Peace, winter evening*." and Wells (1982, pp: 284-5): "Perhaps the most striking example of this phenomenon concerns /r/ sandhi [...]. In native-speaker RP it is usual to use sandhi /r/ in the appropriate places, in the environments where it is 'intrusive' (unhistorical, not corresponding to the spelling) just as in those where it is not. But the speech-conscious tend to regard intrusive /r/ as incorrect, and hence attempt to avoid it. [...], the typical outcome is the suppression of most sandhi /r/'s. [...] Pronunciations which I should consider typical [...] are: *more and more* [ˈmɔːʔən(d) ˈmɔː], *Christina Onassis* [krɪˈstiːnə ʔəʊˈnæsɪs]". Some speakers of adoptive RP or near-RP (non-native speakers of RP) tend to avoid intrusive /r/, consciously or unconsciously owing to the fact that unlike linking /r/, intrusive /r/ may be regarded as incorrect or

slovenly (*pronouncing a letter which isn't there*). Usually, though, such an effort leads to the suppression of all sandhi /r/'s, whether intrusive or merely linking. One widespread tactic is the use of a glottal stop instead of /r/, thus *beer* [ˈbɪəʔ] *isn't, idea* [aɪˈdɪəʔ] *isn't.* A glottal stop may also be used in RP in the crucial environments if the tempo of speech is somewhat slowed down, although, on the whole, *r*-liaison is frequent in all styles of speech (but not necessarily used on every occasion where it would be possible, its avoidance stemming from a deliberate carefulness; cf. Cruttenden 1994: 267). Conversely, glides may be used to create onsets in foot-initial onsetless syllables (see note 56), a phenomenon in complete disagreement with prominence alignment approach.

Additionally, the anti-hiatus approach states that all non-high vowels acquire an epenthetic /r/ whenever they are followed by another vowel, because both /j/ and /w/ are not available in these environments. But there exist varieties which have intrusion after /ə/ and not after /ɑː, ɔː/, where hiatus is tolerated (there are also hypo-rhotic types where hiatus is the norm rather than exception). Cruttenden (1994, pp: 263-7) describes the following gradation in the likelihood of occurrence of /r/ in domain (word)-final position before a vowel:

1) /r/ is obligatory before a suffix beginning with a vowel, where the /r/ is historically justified, e.g. *fearing* always [ˈfɪərɪŋ].

2) /r/ is optional, though generally present, before a following word beginning with a vowel, where the /r/ is historically justified, e.g. *stir it* [ˈstɜːrɪt] rather than [ˈstɜː(ʔ)ɪt].

3) After [ə], /r/ (whether historically justified or not) is generally used before a following word, e.g. *idea is* [aɪˈdɪər ɪz] rather than [aɪˈdɪə(ʔ)ɪz].

4) After [ɑː] and [ɔː], an intrusive /r/ is often avoided before a following word beginning with a vowel, e.g. *the spa at* [spɑː(ʔ)ət] rather than [spɑːrət] and *raw egg* [ˌrɔːˈ(ʔ)ɛg] rather than [ˌrɔːˈrɛg]. (Perhaps it is necessary for an even finer distinction to be recognized, since, as noted by Wells (1982: 225) with reference to the use of intrusive /r/ after /ɔː/: "*There is, however, rather more sentiment against intrusive /r/ in this environment than in those previously mentioned* [i.e. /ə/ and /ɑː/ - P.O.], *due no doubt partly to the fact that it constitutes a more recent development (since* manna-manner, Korea-career, Ma-mar *became homophonous before* law-lore *did) [...].*", there may be accents that use intrusive /r/ after /ə/ and /ɑː/, but not after /ɔː/, e.g. *idea is* [aɪˈdɪərɪz], *ma and* [ˈmɑːrən] but *saw it* [ˈsɔː(ʔ)ɪt].

5) Intrusive /r/ before a suffix is strongly resisted, e.g. *strawy* [ˈstrɔːi] definitely more often than [ˈstrɔːri].

Finally, in some other varieties of English non-etymological /r/ may occur after /ə, ɑː, ɔː/ in word-final or preconsonantal position (these are various hyper-rhotic accents). For example, in some varieties used in rhotic areas of both

England and America (parts of the west-country and southern mountain speech, respectively) the synchronic reflexes of word-final /ə/ and /ər/ have been leveled to /ər/ in all phonetic environments. Therefore for instance *Cuba* is [kjuːbər], *window* [ˈwɪndər], *follow* [ˈfɑlɚ]. Pronunciation such as *idea* /ɑɪˈdɪər/, *law* /lɔər/ may also occur (in New York or Boston) for another reason, namely through inaccurate attempts at restoring the statusful historical /r/. Once /fɪər/ comes to be perceived as more statusful than /fɪə/, and /stɔər/ than /stɔə/, then such pronunciations are naturally likely to arise through the application of an *R*-Insertion rule after any /ɪə, ɛə, ɑə, ɔə, ʊə, ɜ, ə/ indiscriminately.

In conclusion, the spreading account seems to be preferable to the one banning hiatus sequences. In the OT analysis of *r*-liaison to be presented below we will use standard constraints with the exception of:

$V_{([open])}$SPREAD (open) nuclear melodic content is spread, i.e. (open) vowels receive off-glides. This markedness constraint is grounded in that universally the aperture of vowels is large enough for air-flow through it to be smoothly laminar, without significant turbulence. Thus the articulation is maintainable (intrinsic duration of vocoids, Laver 1984: 444), and generally the articulation of a vocoid takes longer than the articulation of a contoid. Thus, there is a greater probability for vocoids of developing glides (glides being, phonetically, ultra-short vowels). The gliding may be of anticipatory type (on-glides) and perseverative type (off-glides). Accordingly, two constraints should actually be recognized sensitive to the direction of spreading. However, since virtually all vowels in English display perseverative gliding (whereas both types of gliding are at work in Polish[4]), we will take the constraint in question to mean off-gliding. Additionally, open vowels are intrinsically of greater duration than close vowels. Catford (1988: 186) observes: "It has been observed in many different languages that, other factors being equal, open vowels tend to be longer than close vowels. It is assumed that the reason for this is that open vowels require a bigger articulatory movement, and it naturally takes longer to execute this than the shorter movement of close vowels." As there are long vowels of both open and close quality in English, we will not recognize two distinct constraints with special reference to vowel height.

*****G[-high] glides are [+high]. Universally glides are either (labio-) velar or (labio-) palatal and both [ɹ] and [ɻ] are uncontroversially [+high].

We will also make use of *****CODA/r constraint (McCarthy 1991) as part of the markedness scale of coda consonants: *****CODA/V » *****CODA/r » *****CODA/l » *****CODA/nas » *****CODA/obs » *****CODA/lar.

[4] See note 3 for examples of on-gliding in Polish. Off-gliding is found in the traditional dialects in the western parts of Poland (Wielkopolska - *Great Poland*), e.g. *ptak* 'a bird' /ptɔwk/, *te!* 'you!' /tɛj/ (Urbańczyk 1984: 26).

In view of the fact that there are accents displaying intrusive *r* only after /ə/, or only after /ə, ɑː/, but there are no accents that have intrusive *r* only after /ɑː/ or only after /ɔː/, we arrive at the following harmonic ranking or implicational generalization: /ər/ > /ɑːr/ > /ɔːr/. Assuming that both /ə/ and /r/ share features of [pharyngeal] constriction and centrality ([-low]), we establish the following ranking of constraints: IDENT$_{[phar]}$ (violated by the sequence /ɔːr/) » IDENT$_{[low]}$ (violated by the sequence /ɑːr/).

5.1. Non-rhotic accents of English

We will first analyze *r*-liaison in varieties displaying it only after /ə/. A crucial assumption made in this analysis is that gliding (spreading) is not a literal consonant insertion, therefore it does not violate DEP. Evidence for a contrastive difference between a spread and true glide may be found in, e.g., Cruttenden (1994: 264): "In vocalic junctures where the first word ends in /iː, ɪ, eɪ, aɪ, ɔɪ/, a slight linking [^{j}] may be heard between the two vowels [...]. But this is not sufficient to be equated with phonemic /j/; indeed there are minimal pairs which illustrate the difference between linking [^{j}] and phonemic /j/, *my ears* [maɪ^{j}ɪəz] vs. *my years* [maɪ jɪəz], and *I earn* [aɪ^{j}ɜːn] vs. *I yearn* [aɪ jɜːn] [. .], *two-eyed* [tuː^{w}aɪd] vs. *too wide* [tuː waɪd]." Similarly, there may be a phonetic difference between a lexical and liaison /r/ as reported by McCarthy (1993, 1999) and Gick (1999) in pairs such as *saw/r/ eels* vs. *saw reels*.

(5) '*... idea if ...*' (the same applies to etymologically *r*-full words, e.g. '*near*')

	/aɪˈdɪə ɪf/	MAX	DEP	*G$_{[-hi]}$	*CODA/r	IDENT$_{[phar]}$	IDENT $_{[low]}$	VSPREAD
(a)	/aɪˈdɪəɪf/							* !
(b)	/aɪˈdɪər.ɪf/				* !			
(c)	☞/aɪˈdɪə.rɪf/							
(d)	/aɪˈdɪətɪf/		* !					*
(e)	/aɪˈdɪɪf/	* !				*	*	*
(f)	/aɪˈdɪəf/	* !						*
(g)	/aɪˈdɪəg̊ɪf/			* !				
(h)	/aɪˈdɪəwɪf/					* !	*	

When several constraints are not ranked with respect to each other, the violation of any of the constraints might be deemed fatal. For instance, the candidate /aɪˈdɪəwɪf/ incurs violations of both IDENT$_{[phar]}$ and IDENT$_{[low]}$ and since these constraints are not ranked with respect to each other, the exclamation point (for

a fatal violation) should be placed in both cells. To keep the presentation as transparent as possible, however, we will mark the fatal violation for just one constraint.

R-liaison may consequently be perceived as being brought about by gliding, inherent in vowels, the actual choice of the melodic make-up of the glide is determined by Faithfulness constraints (IDENT). The most harmonic candidate includes gliding in the form of /r/ syllabified as onset. The VSPREAD constraint is violated by this candidate in non-prevocalic contexts:

(6) '*ideas*' ('*tears*')

	/aɪˈdɪəz/	MAX	DEP	*G$_{[-hi]}$	*CODA/r	IDENT$_{[phar]}$	IDENT $_{[low]}$	VSPREAD
(a)	☞/aɪˈdɪəz/							*
(b)	/aɪˈdɪərz/				* !			
(c)	/aɪˈdɪz/	* !				*	*	*
(d)	/aɪˈdɪə̯z/			* !				
(e)	/aɪˈdɪəwz/					* !	*	

There is also no *r*-intrusion in this variety after /ɑː/. The phenomenon of *r*-liaison is accordingly better described as a fact pertaining to vowels (gliding) and phonotactics (certain segments are not permissible codas) rather than as purely hiatus-induced incident.

(7) '*Ma and*'

	/mɑː ənd/	MAX	DEP	*G$_{[-hi]}$	*CODA/r	IDENT$_{[phar]}$	IDENT $_{[low]}$	VSPREAD
(a)	☞/mɑːənd/							*
(b)	/mɑːr.ənd/				* !		*	
(c)	/mɑː.rənd/						* !	
(d)	/mɑːtənd/		* !					*
(e)	/mɑːnd/	* !						*
(f)	/mɑːn̯ənd/			* !				
(g)	/mɑːwənd/					* !	*	

Similarly, there is no intrusion after /ɔː/ in this variety. We might informally say that in this non-rhotic variety it is more important for vowels to spread faithfully than just to spread (Faithfulness » Markedness).

(8) '*law and*'

	/lɔː ənd/	MAX	DEP	*G[-hi]	*CODA/r	IDENT[phar]	IDENT [low]	VSPREAD
(a)	☞/lɔːənd/							*
(b)	/lɔːr.ənd/				* !	*		
(c)	/lɔː.rənd/					* !		
(d)	/lɔːtənd/		* !					*
(e)	/lɔːnd/	* !						*
(f)	/lɔːg̰ənd/			* !				
(g)	/lɔːwənd/						* !	

Next, we turn to sub-varieties with intrusion after /ə/ and /ɑː/, but not after /ɔː/.

(9) '*... idea if ...*'

	/aɪˈdɪə ɪf/	MAX	DEP	*G[-hi]	*CODA/r	IDENT[phar]	VSPREAD	IDENT [low]
(a)	/aɪˈdɪəɪf/						* !	
(b)	/aɪˈdɪər.ɪf/				* !			
(c)	☞/aɪˈdɪə.rɪf/							
(d)	/aɪˈdɪətɪf/		* !				*	
(e)	/aɪˈdɪɪf/	* !				*	*	*
(f)	/aɪˈdɪəf/	* !					*	
(g)	/aɪˈdɪəg̰ɪf/			* !				
(h)	/aɪˈdɪəwɪf/					* !		*

It will be observed that in this variety the markedness constraint VSPREAD is sandwiched between two faithfulness constraints (Faithfulness » Markedness » Faithfulness).

(10) '*Ma and*'

	/mɑː ənd/	MAX	DEP	*G[-hi]	*CODA/r	IDENT[phar]	VSPREAD	IDENT [low]
(a)	/mɑːənd/						* !	
(b)	/mɑːr.ənd/				* !			*
(c)	☞/mɑː.rənd/							*
(d)	/mɑːtənd/		* !				*	
(e)	/mɑːnd/	* !					*	
(f)	/mɑːg̰ənd/			* !				
(g)	/mɑːwənd/					* !		*

(11) '*law and*'

	/lɔː ənd/	MAX	DEP	*G$_{[-hi]}$	*CODA/r	IDENT$_{[phar]}$	VSPREAD	IDENT $_{[low]}$
(a)	☞/lɔːənd/						*	
(b)	/lɔːr.ənd/				* !	*		
(c)	/lɔː.rənd/					* !		
(d)	/lɔːtənd/		* !				*	
(e)	/lɔːnd/	* !					*	
(f)	/lɔːn̩ənd/			* !				
(g)	/lɔːwənd/					* !		*

We, finally, turn our attention to fully-intrusive varieties, where /r/ occurs after any /ə, ɑː, ɔː/ followed by another vowel. These varieties seem to be relatively uncommon, but at least one such variety is widely known in OT literature. (Some) Boston accents as described by McCarthy (1991, 1993) do appear to be of this very type. In such accents, the markedness constraint of VSPREAD has been promoted so that it dominates both faithfulness constraints (Markedness » Faithfulness).

(12) '*... idea if ...*'

	/aɪˈdɪə ɪf/	MAX	DEP	*G$_{[-hi]}$	*CODA/r	VSPREAD	IDENT$_{[phar]}$	IDENT $_{[low]}$
(a)	/aɪˈdɪəɪf/					* !		
(b)	/aɪˈdɪər.ɪf/				* !			
(c)	☞/aɪˈdɪə.rɪf/							
(d)	/aɪˈdɪətɪf/		* !			*		
(e)	/aɪˈdɪɪf/	* !				*	*	*
(f)	/aɪˈdɪəf/	* !				*		
(g)	/aɪˈdɪəg̊ɪf/			* !				
(h)	/aɪˈdɪəwɪf/						* !	*

Note that the last candidate in the tableau above does not violate DEP as it comes from spreading not from insertion.

(13) '*Ma and*'

	/mɑː ənd/	MAX	DEP	*G[-hi]	*CODA/r	VSPREAD	IDENT[phar]	IDENT [low]
(a)	/mɑːənd/					* !		
(b)	/mɑːr.ənd/				* !			*
(c)	☞/mɑː.rənd/							*
(d)	/mɑːtənd/		* !			*		
(e)	/mɑːnd/	* !				*		
(f)	/mɑːg̊ənd/			* !				
(g)	/mɑːwənd/						* !	*

(14) '*law and*'

	/lɔː ənd/	MAX	DEP	*G[-hi]	*CODA/r	VSPREAD	IDENT[phar]	IDENT [low]
(a)	/lɔːənd/					* !		
(b)	/lɔːr.ənd/				* !		*	
(c)	☞/lɔː.rənd/						*	
(d)	/lɔːtənd/		* !			*		
(e)	/lɔːnd/	* !				*		
(f)	/lɔːg̊ənd/			* !				
(g)	/lɔːwənd/						*	* !

Thus, on the whole, *r*-intrusion may be analyzed as the interaction of specific markedness and faithfulness constraints, with the difference among sub-varieties being attributed to the gradual promotion of one markedness constraint with the subsequent demotion of one faithfulness constraint.

5.2. Hyper-rhotic accents of English

The constraints used in the previous section may also be used to analyze the distribution of /r/ in hyper-rhotic accents. The only stipulation necessary is that the constraint *****CODA/r be demoted, which is borne out by the actual facts, since /r/ is free to occur in codas in the varieties in question[5]. Final (pre-pausal and

[5] *****CODA/r need not be necessarily high-ranked even in otherwise non-rhotic accents in view of the following observation made by Cruttenden (1994: 214): "A more recent development concerns the sequence /r/ + weak vowel + C, in which the weak vowel may be elided, leaving a preconsonantal /r/ (even though /r/ does not normally occur before a consonant in RP), e.g. *barracking* /ˈbærkɪŋ/, *Dorothy* /ˈdɒrθi/, *pterodactyl* /ˈtɛrˈdæktɪl/." These facts may alternatively be taken as evidence for recognizing strata in OT.

pre-consonantal, and of course pre-vocalic) /r/ in words such as *Cuba* is [kjuːbər], *window* [ˈwɪndər], *follow* [ˈfɑlər], *idea* [aɪˈdiər] as used in some accent in the south-west of England may be, therefore, analyzed as below:

(15) south-west of England '*idea*'

	/aɪˈdɪə/	MAX	DEP	*G$_{[-hi]}$	IDENT$_{[phar]}$	IDENT $_{[low]}$	VSPREAD	*CODA/r
(a)	/aɪˈdɪə/						* !	
(b)	☞/aɪˈdɪər/							*
(c)	/aɪˈdɪət/		* !				*	
(d)	/aɪˈdɪ/	* !			*	*	*	
(e)	/aɪˈdɪəə̯/			* !				
(f)	/aɪˈdɪəw/				* !	*		

Note that the ranking IDENT » VSPREAD still holds as there is no hyper-rhoticity after /ɑː/ or /ɔː/.

(16) south-west of England '*Ma*'

	/mɑː/	MAX	DEP	*G$_{[-hi]}$	IDENT$_{[phar]}$	IDENT $_{[low]}$	VSPREAD	*CODA/r
(a)	☞/mɑː/						*	
(b)	/mɑːr/					* !		*
(c)	/mɑːt/		* !				*	
(d)	/mɑːɑ̯/			* !				
(e)	/mɑːw/				* !	*		

(17) south-west of England '*law*'

	/lɔː/	MAX	DEP	*G$_{[-hi]}$	IDENT$_{[phar]}$	IDENT $_{[low]}$	VSPREAD	*CODA/r
(a)	☞/lɔː/						*	
(b)	/lɔːr/				* !			*
(c)	/lɔːt/		* !				*	
(d)	/lɔːɔ̯/			* !				
(e)	/lɔːw/				* !	*		

There are, however, accents where VSPREAD is granted uninhibited sway, that is in some varieties it is more important for vowels to spread than to be faithful to the melodic content. The examples of such varieties are: British pop-singers *saw*

them /sɔːr ðɛm/, New York *cob* /kɑːrb/, New England *law* /lɔːr/. Once again, this is easily accommodated in our analysis (which cannot be said about analyses which assume underlying rhoticity or hiatus-induced *r*-insertion).

(18) New York '*cob*'

	/kɑːb/	MAX	DEP	*G$_{[-hi]}$	VSPREAD	IDENT$_{[phar]}$	IDENT $_{[low]}$	*CODA/r
(a)	/kɑːb/				* !			
(b)	☞/kɑːrb/						*	*
(c)	/kɑːtb/		* !		*			
(d)	/kɑːg̊b/			* !				
(e)	/kɑːwb/					* !	*	

(19) British pop-singers, New England '*saw*'

	/sɔː/	MAX	DEP	*G$_{[-hi]}$	VSPREAD	IDENT$_{[phar]}$	IDENT $_{[low]}$	*CODA/r
(a)	/sɔː/				* !			
(b)	☞/sɔːr/					*		*
(c)	/sɔːt/		* !		*			
(d)	/sɔːg̊/			* !				
(e)	/sɔːw/					*	* !	

And of course, such accents display *r*-intrusion after /ə/. As observed by Gick (2002: 32): "These cases involve the appearance not only of final historical *r*, but also of a historically unattested *r* at the end of certain pre-consonantal or utterance-final words, for which John F. Kennedy gave us numerous examples during the missile crisis in *Cubar*." The analysis of /r/ after /ə/ is presented in the tableau below:

(20) Kennedy's '*Cuba*'

	/ˈkjuːbə/	MAX	DEP	*G$_{[-hi]}$	VSPREAD	IDENT$_{[phar]}$	IDENT $_{[low]}$	*CODA/r
(a)	/ˈkjuːbə/				* !			
(b)	☞/ˈkjuːbər/							*
(c)	/ˈkjuːbət/		* !		*			
(d)	/ˈkjuːbəg̊/			* !				
(e)	/ˈkjuːbəw/					* !	*	
(f)	/ˈkjuːb/	* !						

The presented set of constraints is able, thus, to account for various rhotic phenomena found in non-rhotic and hyper-rhotic accents. The question, however, arises why rhotic accents do not show any gliding of non-high vowels (pronunciation such as [ˈkjuːbɚ] are not attested in, for instance, GenAm). The answer to this question may lie in the fact that /r/ in rhotic varieties is typically retroflex (American and Irish accents) or is a trill (Scottish). Thus, any gliding will necessarily incur violation of higher-ranked faithfulness constraints. In other words, /r/ in these accents is more unfaithful to /ə, ɑː, ɔː/, than it is in non-rhotic accents. Any hyper-rhoticity will, thus, be disallowed by Faithfulness and so there is nothing remotely faithful that non-high vowels could glide onto in rhotic accents. In addition, in hypo-rhotic accents the gliding of non-high vowels to /r/ is prohibited by an undominated markedness constraint FOOT-INIT/r, militating against any /r/ in non-foot-initial position, thus although *red* is pronounced as /rɛd/, in for example American accents of the deep South, *carry* is /ˈkæ̃əi/ and *car* is /kɑː/.

5.3. Spreading of /i/ and /u/

Although we have so far used the established set of constraints to account for various rhotic phenomena, it is also interesting to observe how this analysis works for orthodox gliding phenomena, which accompany the vowels /i/ and /u/.

(21) RP '*see it*'

	/siː ɪt/	MAX	DEP	*G[-hi]	*CODA/w	*CODA/j	IDENT[front]	IDENT [low]	VSPREAD
(a)	/siːɪt/								* !
(b)	/siːj.ɪt/					* !			
(c)	☞/siː.jɪt/								
(d)	/siːrɪt/						* !	*	
(e)	/siːw.ɪt/				* !		*		
(f)	/siː.wɪt/						* !		
(g)	/siːtɪt/		* !						*
(h)	/siːɚɪt/			* !			*	*	
(i)	/siːt/	* !							*

In some, usually non-rhotic, accents (e.g. RP, see Cruttenden 1994) the glides /j, w/ are excluded from codas, much like /r/[6]. Any gliding that may accompany the vowels in question is typically observed in intervocalic positions, exclusively. In view of the fact that glides in these accents are only found in onsets, we recognize two additional markedness constraints *****CODA/j and *****CODA/w as in the tableaux below:

(22) RP '*do it*'

	/duː ɪt/	MAX	DEP	*G$_{[-hi]}$	*CODA/w	*CODA/j	IDENT$_{[front]}$	IDENT $_{[low]}$	VSPREAD
(a)	/duːɪt/								* !
(b)	/duːw.ɪt/				* !				
(c)	··☞/duː.wɪt/								
(d)	/duːrɪt/						* !	*	
(e)	/duːj.ɪt/					* !	*		
(f)	/duː.jɪt/						* !		
(g)	/duːtɪt/		* !						*
(h)	/duːə̯ɪt/			* !			*	*	
(i)	/duːt/	* !							*

Thus, because the two faithfulness constraints (IDENT) are sandwiched between markedness constraints (*CODA and VSPREAD) gliding occurs iff it is faithful to melodic make-up of the preceding vowel. Now, in preconsonantal positions gliding is inhibited by *CODA.

(23) RP '*sees*'

	/siːz/	DEP	*G$_{[-hi]}$	*CODA/r	*CODA/w	*CODA/j	IDENT$_{[front]}$	IDENT $_{[low]}$	VSPREAD
(a)	··☞/siːz/								*
(b)	/siːjz/					* !			
(c)	/siːrz/			* !			*	*	
(d)	/siːwz/				* !		*		
(e)	/siːtz/	* !							*
(f)	/siːə̯z/		* !				*	*	

[6] The *CODA constraint may also apply to /l/, as in some English English accents (e.g. Cockney, Estuary English) where /l/ is typically vocalized in codas, e.g. *fill* [fɪo], (see Wells 1982 for details).

This is a typical behavior of glides in RP. With the demotion of markedness constraints *CODA, glides are free to occur in all positions. The situation when it is more important for high vowels to spread (faithfully) than to obey context-sensitive markedness constraint of *CODA, is well attested in, for instance, GenAm. Gick (1999: 38) notes: "It is also known that final offglides are more clearly audible (or less vocalized) in some dialects than in others. In particular, such retention of final glides is often cited as a feature of General American English, and is indeed true of many American dialects. Similarly, RP, southern U.S. and other *r*-vocalizing dialects are well known for their reduction of final offglides. This pattern of co-occurrence between glide vocalization and final *r*- and *l*-vocalization should not be overlooked."

(24) GenAm '*see(s)*'

	/siː(z)/	DEP	*G$_{[-hi]}$	VSPREAD	IDENT$_{[front]}$	IDENT $_{[low]}$	*CODA/r	*CODA/w	*CODA/j
(a)	/siː(z)/			* !					
(b)	☞/siːj(z)/								*
(c)	/siːr(z)/				* !	*	*		
(d)	/siːw(z)/				* !			*	
(e)	/siːt(z)/	* !		*					
(f)	/siːə̯(z)/		* !		*	*			

5.4. The question of vowels before /r/

The OT analysis presented in the previous sections accounts for *r*-liaison and the gliding of high vowels in a unified way, there, however, remains the problem of the reduced set of vowels in pre-*r* environments. It will be recalled that this analysis assumes underlying non-rhoticity of both historically rhotic and non-rhotic forms in non-rhotic accents. Thus, the problem arises as how to best describe pre-*r* vocalic system. Since /r/ is not present underlyingly, then it cannot influence preceding vowels in any way. But, as observed by McCarthy (1993: 17): "English *r* has profound effects on vowel quality, more than any other consonant. Before tautosyllabic *r*, the vowels ɪ, ɛ, and a are backed (*fir*, *tern*, *car*), and ɪ and ɛ are rhotacized as well." Harris (1994) also comments on the fact that /r/ has both quantitative and qualitative (lowering) influence on preceding vowels.

The observation that /r/ influences preceding vowels (by lowering and/or backing) may, however, be questioned. First, the alleged backing influence fails to materialize in intervocalic positions, as in the (RP) examples: /ɪ/ in *mirror*; /ɛ/

in *bury*, /æ/ in *narrow*; /ʌ/ in *hurry*; /ɒ/ in *sorry*; /ʊ/ in *courier*. Then, the lowering influence is absent in, for example, the accents, which preserve the FORCE-NORTH distinction where *force* is [foː(r)s] but *north* is [nɔː(r)θ]. On the whole, pre-*r* [eː, oː]-type qualities are to be found in accents spread quite widely around the world: in Scottish, Irish, West Indian, some New England and American southern accents. In all of these accents the lowering and backing influence of /r/ seems to have been suspended for some arbitrary reasons (note that it is impossible to resort to the quality of /r/ used in these varieties, as a possible explanation of why they were exempt from the lowering and backing influence of /r/, since /r/ is typically quite retroflex in quality in these accents, just as it is in, say, GenAm). Additionally, the backing and lowering is generally non-existent in Scottish and Irish accents, as in the following examples: *fierce* /fɪrs/, *bird* /bɪrd/, *scarce* /skers/, *pert* /pɛrt/, *start* /start/, *horse* /hɔrs/, *hoarse* /hors/, *word* /wʌrd/, *gourd* /gurd/. But more importantly, the lowering and backing may be held in check, in purely synchronic terms, as the following truncated forms testify (McCarthy 1993: 17, after Kahn 1976: 189): *Cyr* [sɪr] (*[sə˞]) from *Cyril*, *Jer* [dʒɛr] (*[dʒə˞]) from *Jerry*, or *Lar* [lær] (*[lɑːr]) from *Larry*. In sum, it is not necessarily the case that /r/ exert any qualitative or quantitative influence upon preceding vowels in a synchronic mode. Consequently, we claim that the set of pre-*r* vowels is not a derived environment, synchronically. The synchronic instances of reduced vowel contrasts before historical /r/'s are accordingly attributed to lexical storage of diachronic sound changes (see, for example, Sanders 2002 for an OT account of opacity in Polish along the lines of lexical storage of diachronically active, but synchronically unproductive, phenomena).

6. Conclusion

In this paper, I have sought to analyze and explain various phenomena accompanying non-rhoticity. I have endeavored to show that the *r*-liaison in the synchronic systems of non-rhotic accents of English is a natural, non-arbitrary, process. Evidence can be found in the observed regularity and the readiness with which it is transferred to new and foreign words in English. I have also supplied evidence that in non-rhotic accents there is, typically, no contrast between etymologically *r*-ful and *r*-less words, along with further justification for underlying non-rhoticity of both types of words.

I have examined and discussed a number of various approaches to *r*-liaison. This has been done to observe inherent problems and latent flaws, and provide additional evidence for the optimality-theoretic account presented in this very paper. A unified account of non-rhoticity and hyper-rhoticity has, subsequently, emerged.

Furthermore, I have demonstrated a way in which *r*-liaison might be incorporated in the synchronic grammar of non-rhotic accents. Simply put, *r*-liaison could be perceived as another instantiation of VSPREAD conspiracy, where vowels tend to spread their melodic content onto the following segments. The OT machinery was also employed to account for the differences between various subtypes of non-rhotic accents, in terms of re-ranking of several constraints. The peculiar phenomena of hyper-rhoticity have, too, been demonstrated to fit the proposal.

References

ROA = Rutgers Optimality Archive http://roa.rutgers.edu/index.php3

B a k o v i ć, E. 1999. Deletion, insertion and symmetrical identity. ROA–300.

B r o a d b e n t, J. 1991. "Linking and intrusive r in English". *University College London Working Papers in Linguistics* 3: 281–302.

C a t f o r d, J. C. 1988. *A practical introduction to phonetics.* Oxford: Oxford UP.

C r u t t e n d e n, A. 1994. *Gimson's pronunciation of English.* London: Edward Arnold.

G i c k, B. 1999. "A gesture-based account of intrusive consonants in English". *Phonology* 16.1: 29–54.

G i c k, B. 2002. "American intrusive L." *American Speech* 77.2: 167–183.

G i m s o n, A. C. 1980. *An introduction to the pronunciation of English.* third edn. London: Edward Arnold.

H a l l e, M. and I d s a r d i, W. J. 1997. "*r*, hypercorrection and the elsewhere condition". In: R o c a I. M. (ed.). *Derivations and constraints in phonology* Oxford: Clarendon, 331–48.

H a r r i s, J. 1994. *English sound structure.* Oxford: Blackwell.

H u g h e s, A. and T r u d g i l l, P. 1996. *English accents and dialects.* London: Edward Arnold.

J e s p e r s e n, O. 1904. *Lehrbuch der Phonetik.* Leipzig, Berlin: Teubner.

K a g e r, R. 1999. *Optimality Theory: a textbook.* Cambridge: Cambridge UP.

K e n y o n, J. S. 1958. *American pronunciation.* Ann Arbor, Mich.: George Wahr.

L a b o v, W. 1992. *Principles of linguistic change.* Washington, DC: Center for Applied linguistics.

L a v e r, J. 1994. *Principles of phonetics.* Cambridge: Cambridge UP.

M c C a r t h y, J. J. 1991. "Synchronic rule inversion". In: S u t t o n, L. A., J o h n s o n, C. and S h i e l d s, R. (eds.), *Proceedings of the 17th Annual Meeting of the Berkeley Linguistics Society.* Berkeley: Berkeley Linguistics Society, 192–207.

M c C a r t h y, J. J. 1993. "A case of surface constraint violation". *Canadian Journal of Linguistics* 38: 169–95.

M c C a r t h y, J. and P r i n c e, A. [S.] 1995. Faithfulness and reduplicative identity. In: Jill Beckam, Laura Walsh Dickey, & Susan Urbańczyk (eds). *Papers in Optimality Theory* University of Massachusetts Occasional Papers 18; Amherst, Mass.: Graduate Linguistic Student Association, University of Massachusetts, 249–384. ROA–60–0000.

M c M a h o n, April 1996. "On the use of the past to explain the present: the history of /r/ in English and Scots". In: B r i t t o n D. (ed.), *English Historical Linguistics* 1994 Amsterdam: John Benjamins, 73–89.

O s t a l s k i, P. 2004. *Constraints in Optimality Theory. A case study of rhoticity phenomena in English*, unpublished Ph.D. thesis. University of Łódź.

P r i n c e, A. [S.] and S m o l e n s k y, P. 1993. "Optimality Theory Rutgers University". Technical report RuCCS TR–2.

P u l l u m, G. 1976. "The Duke of York gambit". *Journal of Linguistics* 12: 83–102.

R u b a c h, J. 2000. "Glide and glottal stop insertion in Slavic languages: A DOT analysis". *Linguistic Inquiry* 31: 271–317.

S a n d e r s, N. 2002. Preserving synchronic parallelism: Diachrony and opacity in Polish. In" A n d r o n i s, M., B a l l, C., E l s t o n, H. and N e u v e l, S. (eds), *CLS: The Main Session. Papers from the 37th meeting of the Chicago Linguistics Society*, vol. 1. Chicago Linguistics Society, 501–516.

T r u d g i l l, P. and H a n n a h, J. 1994. *International English.* London: Edward Arnold.

U f f m a n n, C. 2002. *R-intrusion as a natural process*. Ms. Universität Marburg.

U r b a ń c z y k, S. 1984. *Zarys dialektologii polskiej*. Warszawa: Wydawnictwo Naukowe PWN.

W e l l s, J. C. 1982. *Accents of English.* Cambridge: Cambridge UP.

W e l l s, J. C. 1991. *Longman pronunciation dictionary.* Burnt Mill, Harlow, Essex: Longman House.

W i e r z c h o w s k a, B. 1980. *Fonetyka i fonologia języka polskiego.* Wrocław: Zakład Narodowy imienia Ossolińskich.