University of Massachusetts Amherst

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A Case of Surface Constraint Violation

JOHN J. McCARTHY

University of Massachusetts, Amherst

The idea that constraints on well-formedness play a role in determining phonological alternations, which dates back at least to Kisseberth's (1970) pioneering work, has by now achieved almost universal acceptance. A tacit assumption of this program, largely unquestioned even in recent research, is the notion that valid constraints must state true generalizations about surface structure or some other level of phonological representation. Anything different would seem antithetical to the very idea of a well-formedness constraint.[1]

In recent work, though, Prince and Smolensky (1991a, 1991b, 1992, 1993) have proposed a model, called Optimality Theory (OT), in which all constraints are in principle violable at surface structure.[2] In OT, a constraint is violated at the surface if and only if some dominant constraint forces it to be violated in some particular linguistic form. (The dominance relations among constraints are specified by a language-particular constraint hierarchy.) This possibility of surface constraint violation, under the pressure of a dominant constraint, is what distinguishes OT from other approaches to constraint satisfaction in phonology, such as those represented in this volume or in Bird (1990), Calabrese (1988), Goldsmith (1990, 1991), Paradis (1988a, 1988b), Singh (1987), and Scobbie (1992b). This article presents an empirical argument for surface violation of constraints, and

[1]I am grateful to the editors of this volume, as well as Morris Halle, Robert Kirchner, Armin Mester, Jaye Padgett, Janet Pierrehumbert, Alan Prince, Lisa Selkirk, David Stampe, and Draga Zec for comments on this article. This research was supported by a Faculty Research Grant from the University of Massachusetts and a fellowship from the John Simon Guggenheim Memorial Foundation.

[2]Optimality Theory was formerly known as Harmony-Theoretic Phonology. In addition to Prince and Smolensky's work, other studies in OT include Archangeli and Pulleyblank (1992:340, 349f.), Hung (1993), Itô et al (1992), Kirchner (1992), McCarthy and Prince (1993), Mester (1993), Rosenthall (1993), Sherer (1993), and Zec (1992).

hence for OT. Specifically, I will justify an essentially complete analysis of alternations involving the consonant *r* in Boston and surrounding communities, and I will show that this analysis requires that a well-formedness constraint be violated on the surface under the pressure of a dominant constraint.

Insertion and deletion of *r* are classic shibboleths of the Eastern Massachusetts dialect, very familiar to other Americans. The examples in (1) are typical:[3]

(1) *r* Deletion, Intrusion, and Linking:

a.	*r* Loss
The spa seems to be broken.	The spa*r* seems to be broken.
He put the tuna down.	He put the tuna*r* down.
The boat tends to yaw some.	You'*r*e somewhat older.
b. *r* Intrusion	*r* Linking
The spa*r* is broken.	The spar is broken.
He put the tuna*r* away.	He put the tuner away.
The boat'll yaw*r* a little.	You're a little older.

Deletion of *r* before a consonant or pause is exemplified on the right in (1a), leading to merger of *spa* and *spar* as [spɑ], *tuna* and *tuner* as [tuwnə], and *yaw* and *you're* as [jɔ]. Merger in the opposite direction, yielding [spɑr], [tuwnər], and [jɔr], takes place in a prevocalic context, as (1b) shows. Traditionally, the non-etymologic *r* on the left in (1b) is called "intrusive *r*" (underscored throughout this article) and the etymologic *r* on the right in (1b) is called "linking *r*".

The core descriptive generalizations underlying the alternations in (1) are quite straightforward and well known. First, *r* must always be followed in the same utterance by a vowel. The consonant *r* never occurs preconsonantally or utterance-finally, even where it would be expected because of etymology or synchronic alternations. Second, the vowels *a*, *ə*, or *ɔ* are never followed by a vowel in the same utterance. Whenever we would expect to find one of these vowels prevocalically, intrusive *r* appears: *sawing* [sɔr̲ɪŋ], *the orchestra is* [ðij ɔkɪstrə̲r̲ ɪz]. (This observation is refined below.)

All previous analysts of these phenomena or their British congeners have recognized that the distribution of *r* is syllabically conditioned (Vennemann 1972:216; Johansson 1973:60; Pullum 1976:90–91; Kahn 1976:109; Mohanan 1985a:146, 1985b; McCarthy 1991; Scobbie 1992a). On the one hand, *r* is

[3]Although I have consulted my own intuitions and observations throughout this work, most of what I say can be confirmed in other studies cited in McCarthy (1991). The transcription follows IPA, except that I have used [r] instead of [ɹ] for English *r*.

deleted in the coda of a syllable (or, equivalently, preserved only in the onset). On the other hand, it is generally agreed that *r* is inserted to resolve hiatus, by separating two adjacent heterosyllabic vowels. I will now review the reasons for these conclusions in some detail, and I will show that, although the prohibition on *r* codas is correct, intrusive *r* is triggered not by a prohibition on hiatus but rather by a less obvious constraint on the structure of word-final syllables.

It is apparent from simple inspection of the data that *r* is never found in the coda of a syllable, whether medial or final: *pa*r*k*, *ca*r*ton*, *spa*r* seems*, *tune*r* nea*r*, you'*r*e somewhat*. The so-called linking *r* is simply an etymologic *r* followed by a vowel in the next word. In that case, the *r* is syllabified as an onset, not a coda, in accord with the constraint ONSET, which prohibits vowel-initial syllables (Itô 1986, 1989):

(2) Junctural Resyllabification:

[spa]$_\sigma$ [r is]$_\sigma$ [tu]$_\sigma$[ne]$_\sigma$[r on]$_\sigma$ [you]$_\sigma$'[re a]$_\sigma$

Resyllabification of this sort is independent of the analysis of *r* and is assumed in many accounts of English phonology. Since *r* in (2) is in the onset, not the coda, it is not deleted.

Intrusive *r* seems to be a response to violations of a prohibition on hiatus. The vowels that precede intrusive *r* (*a*, *ə*, *ɔ*) are not an arbitrary set: they are precisely the non-diphthongal nuclei that can occur word-finally in this dialect of English. The other licit word-final nuclei are all diphthongal: [ij] *busy*, [ej] *delay*, [ɑj] *deny*, [uw] *Peru*, [ow] *veto*, [ɑw] *allow*, [ɔj] *alloy*. The remaining non-diphthongal nuclei (*ɪ*, *ʊ*, *ɛ*) are all strictly prohibited in word-final position (Chomsky and Halle 1968:74). In light of this observation, we can restate the condition as follows: intrusive *r* is found just in case a true vowel-final word is followed by a suffix or another word that is vowel-initial (*sawing* [sɔr̲ɪŋ], *saw Ed* [sɔr̲ ɛd]). But if the first word ends in a consonant or glide, including the off-glide of a diphthong, intrusive *r* does not appear (*seeing* [sijɪŋ], *see Ed* [sij ɛd]). Therefore, intrusive *r* is required precisely when hiatus arises through the concatenation of morphemes and words, as the following examples show:

(3) a. Intrusive *r* Required b. Intrusive *r* Impossible

[sɔ]$_\sigma$[—ɪŋ]$_\sigma$ [sɔ]$_\sigma$[—ɛd]$_\sigma$ [si]$_\sigma$[jɪŋ]$_\sigma$ [si]$_\sigma$[j ɛd]$_\sigma$

In (3a) there is hiatus (and an empty onset), so *r* is required to relieve the hiatus and fill the onset. But in (3b) there is no hiatus and the onset is filled by the glide *j*.

In sum, under this analysis the distribution and alternations of *r* in Eastern Massachusetts can be seen as a response to two constraints on syllabic well-formedness, expressed as in (4):

(4) a. CODA-COND b. NO-HIATUS

$*V r X]_\sigma$ $*V]_\sigma[_\sigma V$

The constraint CODA-COND (4a) (see Itô 1986, 1989) prohibits *r* in post-nuclear position of a syllable or, equivalently, requires that *r* be in the onset. CODA-COND is responsible for the loss of etymologic *r* preconsonantally and utterance-finally. The constraint NO-HIATUS (4b) is an outright prohibition on heterosyllabic vowel-vowel sequences. NO-HIATUS is responsible for the insertion of non-etymologic *r* when *a*, *ɔ*, or *ə* is followed by a vowel. Both of these constraints are formulated here in a way that makes no crucial assumptions about the internal organization of syllables, since that matter is clearly orthogonal to the topic.

Though I have rather casually referred to some *r*s as being "etymologic", these constraints are both active, productive generalizations about this dialect. The most striking evidence of this productivity involves the regular and virtually unsuppressible transfer of *r* deletion, *r* insertion, and *r* linking to borrowed words and even to other languages. Loans and nonce forms that end in *r* must lose it finally or before a consonant: *Notr̸e Dame University*, *palaver̸*, *Omar̸*, *Ishtar̸*, *Kareem Abdul-Jabbar̸*. Likewise, new words ending in *a*, *ə*, or *ɔ* invariably require intrusive *r* before a vowel: *Françoisr̲ is coming*, *rumbar̲ing*, *subpoenar̲ing*, *guffawr̲ing*, *baahr̲ing* (of sheep), *blahr̲er* 'more blah', *a Pollyannar̲ish attitude*, *schwar̲ epenthesis*, *the Beqaar̲ in Lebanon*. And, as Jespersen (1909) notes with examples from Danish and German, *r* deletion and *r* insertion are prominent features of the foreign accent of British (and Bostonian) English speakers: *det brænder̸ gansker̲ op*, *lukker̲ op*, *hatter̲ ich*, *sagter̲ er̸*.

There is an underlying contrast between *r*-final and vowel-final words, so the constraints (4a) and (4b) must both apply actively in the phonology to trigger deletion of *r* and insertion of *r*. Although the synchronic underlying representations do not conform perfectly to etymology (see Johansson 1973; Pullum 1976; Kahn 1976), there is much evidence that the original contrast between final *r* and a final vowel has been preserved in underlying representations under some conditions. One case is the distinction between vowel-final and *r*-final function words, which is documented fully below in (5) and (7). Other evidence is treated at length in McCarthy (1991), so I will not review it here.

The account presented up to this point, consisting of CODA-COND and NO-HIATUS, largely recapitulates the insights of previous analysts. It is successful in dealing with a very broad range of data like that in (1). Nevertheless, there is one factual domain where this analysis fails profoundly and so must be rejected. As we will now see, there are conditions in this dialect where NO-HIATUS is violated freely, and so we must call on a different constraint to account for the *r* intrusion phenomenon. This constraint,

called FINAL-C, requires that words end in a consonant (such as *r*) or a glide. That is, intrusive *r* is a response to a prohibition on vowel-final words, rather than a prohibition on hiatus.

In general, linking *r* and intrusive *r* are not sensitive to any aspect of syntactic constituency or phrasing (see Nespor and Vogel 1982, 1986; Vogel 1986). Therefore, linking *r* and intrusive *r* are found word-internally (*conferral*, *withdrawr̲al*), in word + clitic collocations (*Timor is*, *Cubar̲ is*, *lawr̲ of the sea*), and in compounds and phrases (*far away*, *canolar̲ oil*, *I sawr̲ Ed*). As long as no actual pause intervenes, intrusive *r* and linking *r* are even obligatory across gaps (*What did the dog gnawr̲ after dinner?*), the boundaries of clauses (*The man that I sawr̲ appears to have left*; *The man that I admire appears to have left*), and between intonation phrases (*Lisar̲, I'll see you tomorrow*; *The better, I said, to eat you with*). But there is one specific syntactic condition where intrusive *r* does not occur, and in fact is completely impossible: after a function word. An exhaustive list of vowel-final function words, documenting this behavior, appears in (5):

(5) Lack of *r* Intrusion after Function Words:

a. Modal + reduced *have*
should have (*shoulda*), *could have* (*coulda*), *might have* (*mighta*)
He shoulda eaten. [ʃʊdə(*r̲) ijʔən]

b. Verb + reduced *to*
going to (*gonna*), *want(s) to* (*wanna*, *wantsta*), *ought to* (*oughta*), *have/has to* (*hafta*, *hasta*), *got to* (*gotta*), *used to* (*useta*), *supposed to* (*supposta*).
I'm gonna ask Adrian. [ɑyŋ gənə(*r̲) æsk ejdrijən]
We're supposta eat now. [wijə səpowstə(*r̲) ijʔ nɑw]

c. Auxiliary + reduced *you*
did you, *should you*, *would you*, *could you*
Did you answer him? [dɪdʒə(*r̲) ænsər ɪm]
Would you ask for me? [wʊdʒə(*r̲) æsk fə mij]

d. Reduced *to*, *so*, *by*
To add to his troubles [tə(*r̲) æd tə(*r̲) ɪz trəbəlz]
to Ed [tə(*r̲) ɛd]

e. Reduced *do*
Why do Albert and you [wɑj də(*r̲) ælbət ən juw]

f. Reduced *of*
It was quarter of eight [ɪt wəz kwɔtər ə(*r̲) ejt]
a lotta apples [ə lɔtə(*r̲) æpəlz]

g. *the* ([ðə] ~ [ðij] prevocalically)
the apples [ðə(*r̲) æpəlz] ~ [ðij æpəlz]

Particularly eye-catching are the contrast between *I wanna eat* and *Wandar̲ eats* or the contrast within the phrase *gonna invoke the lawr̲ of*, uttered by my former Congressman Edward Markey. These examples are all in violation of NO-HIATUS, yet they cannot receive intrusive *r*. They constitute a prima facie case against the standard syllabically-conditioned analysis of *r* insertion.

Various ways of salvaging NO-HIATUS come to mind, but none survive close scrutiny. Kahn (1976), who first noted the facts in (5), considers an account based on rule ordering, in which reduction of function words applies after *r* insertion. For instance, underlying *to eat* /tuw ijt/ does not violate NO-HIATUS, and so it would not undergo *r* insertion. Sometime later in the derivation, NO-HIATUS would stop applying and only then is /tuw/ reduced to [tə].

But, as Kahn also notes, this stipulated rule ordering cannot explain why all reduction rules applying to the ends of function words, including reduction of the vowel in *to* and deletion of the *v* in *of* and *have*, must apply after NO-HIATUS has stopped functioning. Worse yet, it cannot explain why all reductions applying to the beginnings of function words must occur earlier, while NO-HIATUS is still in force, as the following examples show:

(6) *r* Linking and *r* Intrusion Before Reduced Function Words:

a. Loss of initial *h* in *has*, *had*, *he*, *him*, *her*

Cuba has been in the news lately.	[kjuwbəɹ̲ əz]
Cuba had better be in the news today.	[kjuwbəɹ̲ əd]
It's Timor he wants to see.	[tijmɔr ij]
I saw him.	[sɔɹ̲ ɪm]
I admire her.	[ədmɑjər ə]

b. Loss of initial *w* in *was* (fast speech), *will*, *would*

Cuba was in the news lately.	[kjuwbəɹ̲ əz]
Timor was in the news lately.	[tijmɔr əz]
Cuba will be in the news.	[kjuwbəɹ̲ əl]
Timor would make some news.	[tijmɔr əd]

c. Loss of initial ð in *them*, *than*

I saw them.	[sɔɹ̲ ɛm]
I admire them.	[ədmɑjər ɛm]
It's more blah than that.	[blɑɹ̲ ən]

It is surely an improbable coincidence that the various rules reducing function words, sorted only by the position in which they apply, should be ordered differently with respect to the enforcement of NO-HIATUS and consequent *r* insertion.

It is also improbable that the reductions exemplified in (5), all of which are lexically idiosyncratic, would apply after a general postlexical constraint like NO-HIATUS. Evidence for the lexical character of these function-word reductions is extensive (see Zwicky 1970; Selkirk 1972; Kaisse 1985:35). But if they are all lexical rules, it makes no sense to order them after a phrase-level constraint like NO-HIATUS has ceased applying.

Another possible approach to the data in (5) would be to impose some sort of restriction on NO-HIATUS itself, making it inapplicable to function words. It is not clear how such a restriction would be formulated (perhaps via exception features or a specification of syntactic domain), but in any case it will not work, as the data in (7), (8), and (9) show. First, linking *r*, as opposed to intrusive *r*, occurs freely after function words, so function words themselves cannot be barriers to syllabification or to constraints on syllabification like NO-HIATUS:

(7) *r* Linking After Function Words:

They're eating.	Tom and I are eating.
Tom and I were eating.	Our answer was . . .
Their answer was . . .	He didn't give her any trouble.
. . . for any reason . . .	. . . either apples or oranges . . .
After all . . .	Under any circumstances . . .

The linking *r*s in (7) show no tendency at all to delete, despite the fact that they occur at the ends of function words, where intrusive *r* is prohibited.

Second, both intrusive and linking *r* are obligatory *before* function words, so function words cannot be general exceptions to NO-HIATUS:

(8) *r* Linking and *r* Intrusion Before Function Words:

Cubar̲ is . . .	Timor is . . .
Cubar̲ and Yemen . . .	Timor and Yemen . . .
. . . accused Cubar̲ of . . .	accused Timor of . . .
. . . put Cubar̲ on notice.	. . . put Timor on notice.
I sawr̲ it.	You're it.

If function words were somehow marked as immune to NO-HIATUS, we would not expect to find intrusive *r* before a function word, as in (8).

Finally and most remarkably, intrusive *r* does occur even after a function word, but only if the function word is itself in phrase-final position. Because monosyllabic function words like *to* do not reduce phrase-finally, this sort of behaviour is restricted to portmanteaus like *shoulda*, *gonna*, or *didja* in (5a) to (5c).

(9) *r* Intrusion After Phrase-Final Function Words:

I said I was gonnar and I did.
Did you or didn't you? [dɪdʒər ə dɪdən jə]
We oughtar if we're asked.
We shouldar, I guess, gotten more charcoal.
If you haftar, I'll help.

In these examples, which were brought to my attention by Lisa Selkirk, a function word occurs at the end of a phonological phrase, followed by a vowel-initial word in the next phrase of the same utterance, without intervening pause. Under just this condition, intrusive *r* does follow function words.

These observations reveal a fundamental failure of NO-HIATUS: there is no way to explain why it is enforced everywhere except after a function word in phrase-medial position. No limitation on the ordering, domain, or applicability of NO-HIATUS, regardless of conception, can account for the full range of this phenomenon. Therefore, despite its inherent plausibility, NO-HIATUS must be rejected as the explanation for *r* intrusion, and so we must look elsewhere.

The observation that intrusive *r* is found "except after a function word" is equivalent to "always after a lexical word". Leaving (9) aside for now, it is apparent that intrusive *r* is found only at the ends of lexical words. The lexical word with intrusive *r* may itself be contained inside a larger word by virtue of a Level II suffix (*drawring*, *withdrawral*), but the consistent generalization is that intrusive *r* is limited to lexical-word-final position. Restating the conditions on intrusive *r* in this way leads to a constraint that is very different from NO-HIATUS. This new constraint, FINAL-C in (10), governs the shape of the final syllable in a prosodic (i.e., phonological) word:

(10) FINAL-C

$*V)_{PrWd}$

That is, a Prosodic Word (PrWd) cannot end in a (short) vowel, though it can end in a consonant or glide.[4] Since, as we have already seen from the discussion of NO-HIATUS, the vowels triggering *r* intrusion (ə, ɔ, *a*) are the only true vowels occurring in word-final position in English, the real effect of FINAL-C is to prohibit prosodic words ending in one of these three

[4]There are several other equivalent ways of characterizing the class of *r*-triggering vowels, and so there are several equally good statements of FINAL-C. For example, this constraint could be replaced by prohibitions on final non-high vowels, on final short vowels, on final lax vowels, or even on final light syllables (disregarding the potential effects of final consonant extrametricality).

vowels. Intrusive *r* is a response to violations of this constraint, rather than NO-HIATUS.

FINAL-C provides a compelling explanation for the facts in (5) that were so problematic for NO-HIATUS. The explanation depends on some fundamental results in the study of sentence phonology regarding differences between lexical words and function words (see e.g., Selkirk 1984; Kaisse 1985; Nespor and Vogel 1986). Because each lexical word corresponds to a Prosodic Word, a sequence of lexical words like $(John)_{PrWd}$ $(saw)_{PrWd}$ $(Ed)_{PrWd}$ is bracketed into a sequence of Prosodic Words as shown. In obedience to FINAL-C, intrusive *r* is obligatory at the end of the Prosodic Word *saw*.[5] But function words in English are usually proclitic, meaning that they attach to a following Prosodic Word instead of forming one of their own. Therefore the function words in examples (5d) to (5g) are not subject to FINAL-C, since they are not in Prosodic-Word-final position: $(to\ add)_{PrWd}$, $(do\ Albert)_{PrWd}$, $(of\ eight)_{PrWd}$, and $(the\ apples)_{PrWd}$. Whether the portmanteaus *shoulda*, *gonna*, or *didja* in (5a) to (5c) are also proclitic has not been discussed in the literature, but by parity of reasoning they should procliticize too, giving structures like $(shoulda\ eaten)_{PrWd}$, $(gonna\ eat)_{PrWd}$, and $(didja\ eat)_{PrWd}$ that account for the lack of intrusive *r*.

The constraint FINAL-C also illuminates the problematic facts in (9). As Lisa Selkirk has pointed out to me, there is one condition where a proclitic must be promoted to the full status of an independent Prosodic Word (Selkirk 1984:366; Selkirk and Shen 1990:332–335; Selkirk and Tateishi 1988). Procliticization is impossible in phrase-final position without violating the proper bracketing of prosodic categories demanded by the Prosodic Hierarchy. Most English function words simply fail to reduce when they cannot procliticize (*He wanted [tuw] and I didn't*), so they would not be expected to have intrusive *r*. But portmanteaus like *shoulda*, *gonna*, or *didja* do occur phrase-finally, where they require intrusive *r*, as shown in (9): *I [wɔnər] and he doesn't*. For example, the bracketing of *Did you or didn't you* is $\{(didja)_{PrWd}\}_{PPh}$ $\{(or\ didn't\ ya)_{PrWd}\}_{PPh}$, in which the function word *didja* must lie at the right edge of a Prosodic Word because it also lies at the right edge of a Phonological Phrase. In just this type of case, intrusive *r* occurs after a function word, as required by FINAL-C.

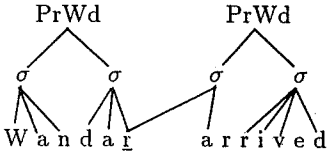
There can be little doubt, then, that FINAL-C is a significant descriptive improvement over NO-HIATUS. It is also at least as good explanatorily.

[5]Following Inkelas (1989), I assume a recursive Prosodic Word structure for lexical words followed by enclitics or Level II suffixes, like $((saw)_{PrWd}\ 'em)_{PrWd}$ or $((saw)_{PrWd}ing)_{PrWd}$. The inner PrWd-brackets of $((saw)_{PrWd}\ 'em)_{PrWd}$ or $((saw)_{PrWd}ing)_{PrWd}$ are necessary features of the analysis, since they condition FINAL-C, but there is no direct evidence for the outer brackets, because English has no enclitics or Level II suffixes ending in ə, ɔ, or *a*.

Although constraints like FINAL-C are perhaps not as common as NO-HIATUS, versions of it are amply precedented in the phonologies of other languages and in the literature. For example, Arabic noun and verb stems must end in a consonant, as must those of many other languages. McCarthy and Prince (1990:14f.) obtain this result from the requirement that all stems end in an extrametrical syllable, which is necessarily degenerate. Piggott (1991:304) imposes a very similar requirement on words of Yapese. Casting the net more widely, we find constraints like FINAL-C implicated in the neutralization of final quantitative contrasts in languages like Axininca Campa, Choctaw, or colloquial Arabic (see McCarthy and Prince 1993; Hung 1993; Itô and Mester 1992). And analogues to FINAL-C elsewhere in English include the constraint responsible for stem-level lengthening of final non-low vowels and dialectal phenomena like the "Bristol *l*", which appears after all final schwas (whether in hiatus or not), making *area* and *aerial* homophonous.

The proper enforcement of FINAL-C relies on a particular assumption about syllabification. Specifically, FINAL-C expresses a true generalization about English syllable structure only if we adopt Kahn's (1976) proposal that word-final consonants are ambisyllabic when the next word begins with a vowel (see Paradis 1980; Gussenhoven 1986):

(11) Junctural Ambisyllabification:



In *Wandar̲ arrived*, the ambisyllabic *r* simultaneously satisfies FINAL-C and fills the onset of *arrived*. Complete resyllabification of word-final consonants, assumed above in (2), is incompatible with the statement of FINAL-C. Because PrWd dominates σ in the Prosodic Hierarchy, resyllabifying a consonant would shift it from one PrWd to the next: $([Wan]_\sigma\ [dar]_\sigma)_{\text{PrWd}}\ ([a]_\sigma\ [rived]_\sigma)_{\text{PrWd}} \rightarrow *([Wan]_\sigma\ [da]_\sigma)_{\text{PrWd}}\ ([ra]_\sigma\ [rived]_\sigma)_{\text{PrWd}}$. With this sort of resyllabification, FINAL-C would always be violated on the surface. Hence, the properties of intrusive *r* argue in favour of ambisyllabicity and against alternative accounts of English surface syllabification. Indeed, junctural ambisyllabification, as opposed to resyllabification, can be seen as a way to satisfy both ONSET — which discountenances VC.V syllabification — and FINAL-C — which demands PrWd-final consonants.

Junctural ambisyllabification, as in (11), accounts for a further property of linking and intrusive *r*: they are phonetically distinct from true word-initial *r*. The examples in (12) are all minimal or near-minimal pairs exemplifying this distinction:

(12)	I sawr̲ eels (in the fishmarket).	I saw reels (of film).
	Wandar̲ adduced (a crucial example).	Wanda reduced (the sauce).
	Wandar̲ announced (her engagement).	Wanda renounced (her fortune).
	The Shahr̲ accords (with his view).	The Shah records (Radio Tehran).
	Sabah has more oil than Saud.	Sabah is more royal than Saud.
	I'll have another ale.	I'll have another rail.
	Your edema [jɔr ədijmə]	Your redeemer [jɔ rədijmə]

As Kahn (1976) notes, word-initial consonants are never ambisyllabic, but word-final ones can be.[6] Thus, there is a clear contrast in each of these minimal pairs. Preliminary phonetic investigation shows that the principal difference between, say, *sawr̲ eels* [sɔr ijlz] and *saw reels* [sɔ rijlz], is that the *r* in *sawr̲ eels* is considerably more vocalic, with more energy at all frequencies. This kind of phonetic difference is not too surprising, since coda *r*s are known to be more vocalic than onset *r*s in other English dialects.

The minimal pairs in (12) are obviously reminiscent of better-known examples of junctural contrast like *nitrate/night rate* or *an aim/a name*. Ambisyllabicity provides a way of representing this distinction phonologically. Moreover, ambisyllabicity of linking and intrusive *r* is fully consistent with their observed phonetic properties. Ambisyllabic *r* is relatively vocalic because it participates, at least in part, in the general weakening of coda *r* that pervades English dialects, including those like Standard American that have no *r* deletion. Thus, the facts in (12) provide strong confirmation for (11) and the associated constraint system, particularly FINAL-C.[7]

On the other hand, an analysis based on NO-HIATUS is entirely unable to represent the contrast in (12). The problem is that the violation of

[6] Brian O'Herin and Philip Spaelti, on behalf of the UC Santa Cruz Phonology Reading Group, have pointed out to me that there is a straightforward interpretation of Kahn's observation in terms of constraints of the Alignment family (Prince and Smolensky 1991b, 1993: Chap. 7; McCarthy and Prince 1993: Chaps. 4, 7). Alignment constraints require coincidence of the edges of morphological and prosodic constituents. In the present instance, the constraint of interest is ALIGN-L:

ALIGN-L

$[_{\text{MWd}} = [_{\text{PrWd}}$

That is, the left edge of any Morphological Word should coincide with the left edge of a Prosodic Word. Ambisyllabicity of a MWd-initial consonant violates ALIGN-L, since the resulting PrWd has no edge.

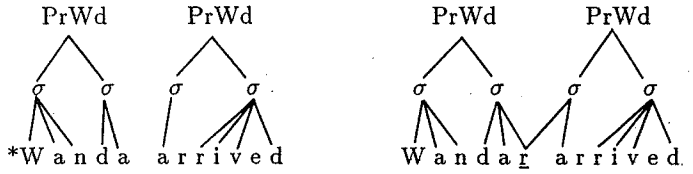
[7] An alternative to ambisyllabification is to keep the PrWd-final consonant in coda position, as proposed by Stampe (1979), Selkirk (1982), Myers (1987), and Borowsky (1986). This approach would account for the contrast in (12), but it is unable to characterize the distribution of *r* syllabically. It must instead resort to a purely segmental characterization of the distribution of *r*, either prohibiting *r* preconsonantally and utterance-finally or licensing *r* only when prevocalic.

NO-HIATUS in, say, *saw eels* should be repaired by inserting *r* into the empty onset of *eels*. But then *saw reels* and *saw reels* would have identical phonological representations, contrary to fact. Because, under NO-HIATUS, intrusive *r* is *never* assigned to coda position, there is no reason to expect it to behave any differently from any other *r* in the onset.

In sum, we have established the correctness of ambisyllabification of linking and intrusive *r*, as in (11). Before continuing, we should note that the conditions on *r* deletion change slightly once we assume ambisyllabification (Kahn 1976:109). Specifically, *r* is prohibited when it is in the coda and not also in the onset. There are at least two principled ways to incorporate this refinement into the enforcement of CODA-COND. First, if enforcement of CODA-COND is subject to the Linking Condition (Hayes 1986; Itô 1986, 1989), any *r* which is linked to both coda and onset position is immune to this constraint. Second, if CODA-COND is reformulated as a positive condition licensing *r* only in onsets (Kahn 1976; cf. Lombardi 1991), the fact that ambisyllabic *r* is also in a coda will not affect it.[8] Either of these alternatives is fully satisfactory on all counts.

Let us now summarize the results to this point. We have established that intrusive *r* is a consequence of FINAL-C (10) and deletion of *r* is a consequence of CODA-COND (4a), subject to the refinements just noted. The operation of these two constraints depends further on junctural ambisyllabification (11), which affects any PrWd-final consonant followed by a vowel in the same utterance. The application of FINAL-C is illustrated in (13) with the ə-final word *Wanda* and the *r*-final word *Homer* (cf. *Homeric* McCarthy 1991):

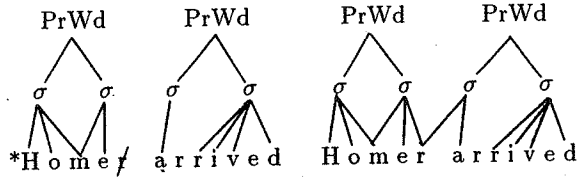
(13) FINAL-C Obeyed:

a. 

[8] A seeming problem for this analysis is that, according to Nespor and Vogel (1982:249–250, 244–246) and Hayes (1989:219), *r* linking and intrusion take place on the utterance domain, but another process sensitive to ambisyllabification, *t*-flapping, applies only within intonation phrases and not to whole utterances. This observation does not seem to be correct, at least for my dialect, where both rules apply at utterance level:

If you come from Minnesota[r], everybody likes you.
If you come from Connecticu[ɾ], everybody likes you.

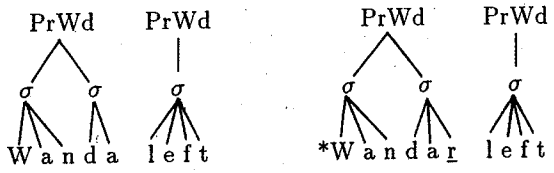
Nespor and Vogel (1986:223–226, 246) withdraw the observation.

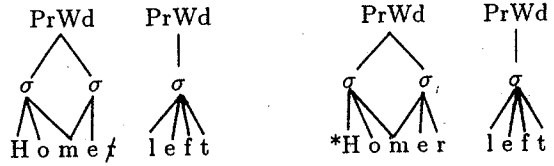
b. 

The ungrammatical forms in (13) are in violation of FINAL-C, whereas the actual output forms obey both FINAL-C and CODA-COND.

A paradox arises, though, when we look at the same forms in a prepausal or preconsonantal context:

(14) FINAL-C Violated:

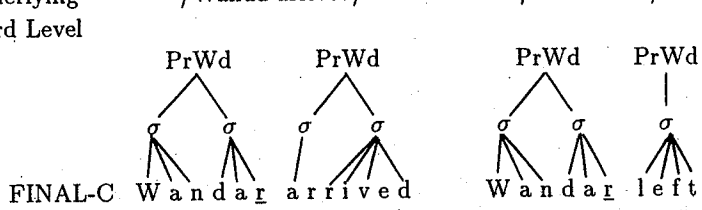
a. 

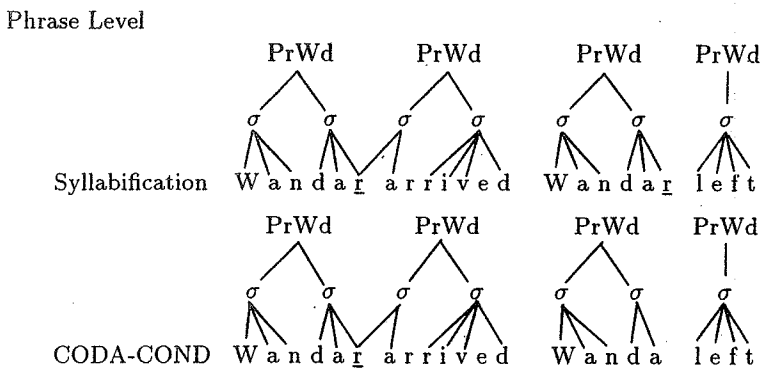
b. 

In (14), the grammatical forms actually violate FINAL-C and the ungrammatical ones obey it. What we have here, then, are uncontroversially grammatical surface representations in which the constraint FINAL-C is violated. CODA-COND, on the other hand, gives just the opposite result: it is obeyed by the grammatical examples and violated by the ungrammatical ones.

A seemingly workable alternative to the surface violation of FINAL-C is possible by careful segregation of the two constraints into different levels. Specifically, it is necessary to enforce FINAL-C at Word level but not at Phrase level, while CODA-COND is enforced at Phrase level but not at Word level. Thus, all vowel-final words will receive intrusive *r* at Word level, but intrusive *r* will be deleted phrasally when it cannot be resyllabified as an onset:

(15) Level Segregation of FINAL-C and CODA-COND:





This analysis may be a descriptive success, but it is an explanatory failure. The derivations are dubious, because many *r*s are inserted at Word level only to be deleted phrasally in what Pullum (1976) calls the "Duke of York gambit". It is not even clear that FINAL-C can be a Word-level constraint, because Phrase-level information is needed to determine what the Prosodic Words are, as the evidence in (9) shows. But the most serious problem with this analysis is that the assignment of constraints to levels is arbitrary and unmotivated. Although the imposition of FINAL-C at Word level is sensible, there is no reason why it should turn off at Phrase level, nor is there any reason why CODA-COND should be imposed at Phrase level and not earlier. So the perfect complementarity in the levels at which the two constraints are applicable is ad hoc and inexplicable under any view of rule typology. We must look elsewhere to reconcile the basic conflict between CODA-COND, a constraint which is always obeyed at the surface, and FINAL-C, a constraint which is sometimes violated at the surface.

Optimality Theory (Prince and Smolensky 1991a, 1991b, 1992, 1993) provides precisely the framework required to account for this observation. In OT, a constraint conflict occurs if and only if two constraints A and B make competing, incompatible demands on well-formedness, so that there exist forms where if A is obeyed, B is violated, and if B is obeyed, A is violated. The fundamental claim of OT is that such constraint conflicts lie at the heart of phonological description, and they are resolved by specifying dominance relations between constraints. If constraint A dominates constraint B, expressed as A >> B, then B will be violated at surface structure if A forces it to be in some particular linguistic form. That is, any lower-ranking constraint is violated at surface structure if and only if some higher-ranking constraint forces it to be.

A further claim of OT, closely linked with surface constraint violability, is language-particular constraint ranking. The constraint rankings of a language L, arranged into a constraint hierarchy (a partial ordering) for L, are determined by examining all of the constraint conflicts in L. Indeed, OT

claims that differences in constraint ranking are the basis of all interlinguistic differences. After all, in the limiting case, ranking a constraint below all others is effectively the same as not enforcing it at all.

Anticipating the fuller development of the analysis below, let us see how OT deals with the interaction of CODA-COND and FINAL-C in the Eastern Massachusetts dialect. These two constraints are in conflict, in the sense defined by OT, because the actual surface forms *Wanda left/Homeɹ left* obey CODA-COND and violate FINAL-C, while the hypothetical surface forms **Wandar left/*Homer left* follow precisely the opposite pattern, violating CODA-COND and obeying FINAL-C. That is, CODA-COND and FINAL-C make competing, incompatible demands on well-formedness in *Wanda left/Homeɹ left*, and this conflict is resolved by stipulating that CODA-COND dominates FINAL-C: CODA-COND >> FINAL-C. Because of this dominance relation, the surface forms *Wanda left/Homer left* obey CODA-COND at the expense of violating FINAL-C. This means, of course, that FINAL-C is a constraint that is sometimes violated in surface representations.

Optimality Theory shares its concern for the notions of constraint conflict, ranking, and violation with an earlier, pioneering approach to constraint satisfaction in phonology, the Theory of Constraints and Repair Strategies (TCRS) (Paradis 1988a, 1988b, *et seq.*). Thus, there are some abstract similarities of conception between the two theories, but there are also significant differences in how these core ideas are actually defined and implemented.[9]

TCRS ranks constraints according to a universal principle, the Phonological Level Hierarchy (PLH) (Paradis 1988a, 1988b). According to the PLH, constraints on the well-formedness of higher-level constituents take precedence over constraints on lower-level ones, and, in case of conflicting constraints at the same level of constituency, precedence follows the linear order in which violations are created. In OT, though, constraint ranking is language-specific; indeed, the ranking CODA-COND >> FINAL-C required in Eastern Massachusetts is inconsistent with the PLH, since FINAL-C, a PrWd-level constraint, should take precedence over CODA-COND, a σ-level constraint.

This difference in the source of constraint ranking is a relatively minor matter, however. A far more important distinction between OT and TCRS lies in the identification and ultimate disposition of constraint conflicts. In TCRS, a constraint conflict occurs when repairing one constraint violation would create a violation of another constraint. For example, in Gere (Paradis 1988b:12), raising ɔ to *u* in /wɔ-ɛ/ 'I make PRO shout'

[9]Thanks to Robert Kirchner and Carole Paradis for helpful discussion of this. Also see Prince and Smolensky (1993: Chap. 10) for further discussion.

repairs a violation of *ɔɛ, but it creates a violation of *ʍʊ, so *ɔɛ and *ʍʊ are in conflict in the TCRS sense. That is, a conflict between two constraints in TCRS is really an asymmetrical conflict between one constraint itself and the rule repairing the other constraint. In OT, constraint conflict is a very different matter: it is a fully symmetrical conflict between two constraints that make incompatible demands on the well-formedness of the final output, and it is not relativized to any particular repair strategy. In the Eastern Massachusetts dialect, CODA-COND and FINAL-C are in conflict in the OT sense: the output obeys one and violates the other.

The disposition of constraint conflicts is also very different. In TCRS, although constraint conflicts will lead to violations at intermediate stages of the derivation (so Gere underlying /wɔ–ɛ/ becomes intermediate /wʊ–ɛ/, which violates *ʍʊ), such derivative constraint violations are simply repaired at the next step of the derivation (so Gere /wʊ–ɛ/ becomes *gʊ–ɛ*, repairing the violation of *ʍʊ). Thus, there can be no surface constraint violations in TCRS, and all constraints must state phonotactic truths. In OT, as I have noted, constraint conflicts lead to surface constraint violations. This is again what we require in Eastern Massachusetts, since FINAL-C is not an absolute phonotactic truth; rather, it is obeyed only when it does not conflict with dominant CODA-COND.

In OT, derivations proceed in parallel, meaning that the constraint system selects an output form for a given input without passing through intermediate stages. In this respect, OT resembles the Constraint-Based Phonology of Bird (1990) or the Declarative Phonology of Scobbie (1992b) more than it does the standard theory or TCRS. Nevertheless, OT is a multistratal theory, with separate underlying and surface representations and even the possibility of separate blocks of constraints organized in lexical levels (McCarthy and Prince 1993: Chap. 3, Appendix). My focus here, however, will be on constraint ranking and surface violability in OT, though I discuss the theory's parallel derivations in the appendix.

The satisfaction of a system of ranked well-formedness constraints is the core analytic concept in OT, so we must examine this idea very closely before continuing with the analysis. Except for ties, the candidate that passes the highest ranked constraint is the output form. A tie occurs either when more than one candidate passes the highest ranked constraint or when all candidates fail the highest ranked constraint. In case of ties, all surviving candidates are tested recursively against the rest of the hierarchy. In other words, the candidates surviving a tie are passed to the next highest constraint and so on until exactly one candidate passes. At that point, the remaining, lower-ranked constraints are irrelevant; whether the sole surviving candidate obeys them or not does not affect its grammaticality.

The following example illustrates schematically how satisfaction of a constraint hierarchy proceeds. Assume a grammar consisting of two constraints, A and B. Like any grammar, this one functions to pair underlying forms with surface forms: (in_1, out_1), (in_2, out_2), and so on. Suppose we have a certain underlying form /in_k/ which gives rise to a candidate set {$cand_{k1}$, $cand_{k2}$}, and that $cand_{k1}$ is the actual output form.

If both A and B agree in their evaluation of the candidate set, then there is nothing to say. The optimal candidate — the output associated with in_k — is just the one that meets both constraints, as in standard approaches to constraint satisfaction. If A and B disagree, however, we have a constraint conflict, represented by the following tableau:

(16) Constraint Tableau, A >> B, /in_k/

Candidates	A	B
⇒ $cand_{k1}$		*
$cand_{k2}$	*!	

Here candidate $cand_{k1}$ meets A but fails B; while $cand_{k2}$ meets B but fails A. Because $cand_{k1}$ is, by assumption, the actual output form, we say that constraint A dominates constraint B (A >> B), in the sense that, when A and B disagree on a candidate-pair, the decision between them is made by A alone. This tableau observes certain notational conventions: constraints are written in their domination order, violations are marked by *, and crucial violations are also signalled by !. Shading emphasizes the irrelevance of the constraint to the fate of the candidate. A loser's cells are shaded after a crucial violation; the winner's, when there are no more competitors.

Let us now return to the case at hand, the conflict between CODA-COND and FINAL-C which leads to a surface violation of FINAL-C in the Eastern Massachusetts dialect. The problem presented by examples like *Wanda left* or *Homer left* in (14) is that FINAL-C is violated, though CODA-COND is not. If the situation were reversed, with FINAL-C obeyed and CODA-COND violated, the result would be ungrammatical: **Wandar left*, **Homer left*. This type of case, where two constraints give exactly contradictory results, is precisely what OT addresses. These facts show, quite simply, that the phonology of this dialect includes the language-particular constraint ranking CODA-COND >> FINAL-C. Tableau (17) shows how this constraint hierarchy selects the correct output form:

(17)

Candidates	CODA-COND	FINAL-C
⇒ PrWd PrWd: σ σ σ — W a n d a l e f t		*
⇒ PrWd PrWd: σ σ σ — H o m e ɾ l e f t		
PrWd PrWd: σ σ σ — W a n d a r l e f t	*!	
PrWd PrWd: σ σ σ — H o m e r l e f t		

The candidates *Wanda left/Homeɾ left* obey the dominant constraint CODA-COND, whereas the candidates **Wandar left/*Homer left* violate it. Thus, *Wanda left* and *Homeɾ left* are selected as the actual output forms; the fact that they violate the lower-ranked constraint FINAL-C is irrelevant, according to the principles of OT.

The candidates **Wanda arrived/*Homeɾ arrived* and *Wandar arrived/ Homer arrived* all obey the dominant constraint CODA-COND. This tie is resolved in the usual way, by passing the candidates on to the rest of the constraint hierarchy, in this case FINAL-C. As (18) shows, FINAL-C then rejects **Wanda arrived/*Homeɾ arrived*.

(18)

Candidates	CODA-COND	FINAL-C
PrWd PrWd: σ σ σ σ — W a n d a a r r i v e d		*!
PrWd PrWd: σ σ σ σ — H o m e ɾ a r r i v e d		
PrWd PrWd: σ σ σ σ — W a n d a r a r r i v e d		
⇒ PrWd PrWd: σ σ σ σ — H o m e r a r r i v e d		

Recall that *Wandar arrived* and *Homer arrived* obey CODA-COND since, as I argued above, the junctural *r* is ambisyllabic. In this case, then, no surface constraint violation is necessary, since the actual output form obeys both constraints in the hierarchy.

It is apparent that the Optimality-Theoretic account of Eastern Massachusetts *r* is a descriptive success, since it yields the correct results in all contexts, given the various candidates with and without final *r*. To assess its value as an explanation, we should first note that it achieves these results with just a single stipulation, the relative ranking of CODA-COND and FINAL-C. Since the ranking of constraints is part of the grammar of particular languages, a further test of the explanatory value of a constraint system is to ask whether the opposite ranking describes a real (or at least plausible) language. The inverted constraint hierarchy FINAL-C >> CODA-COND characterizes a language in which *r* is absent from word-medial codas but required word-finally, even before a consonant or pause (*Wandar left*, *Homer left*). Though no language known to me has precisely this distribution of *r*, the overall pattern is a familiar one, usually attributed to final consonant extrametricality. So, for example, Diola Fogny restricts coda consonants medially but not finally (Itô 1986, 1989) and Yiddish devoices coda obstruents, but again not word-finally (Lombardi 1991). Indeed, according to Piggott (1991), Yapese has no codas at all word-internally, but requires that all words end in a consonant. Yapese, then, is just what the inverted constraint hierarchy predicts, with CODA-COND generalized from *r* to all consonants.

In conclusion, we have seen that surface forms like *Wanda left/Homeɾ left* must violate the well-formedness constraint FINAL-C. This surface constraint violation occurs because the dominant constraint CODA-COND rules out the alternative candidate forms **Wandar left/*Homer left*. The analysis provides strong confirmation for a fundamental tenet of OT, surface violability of constraints as required by other, dominant constraints. This case of Optimality-Theoretic constraint interaction seems particularly compelling, because the constraints themselves are unusually well-supported both within the dialect and cross-linguistically, and because alternative solutions to the interaction problem are significantly inferior to the Optimality-Theoretic one.

Appendix
Candidate Forms and Repair Strategies

The text of this article has focused on surface violation of a constraint under the pressure of a higher-ranking constraint, but there is another, logically distinct aspect of Optimality Theory as conceived by Prince and Smolensky: constraints select the correct output form from a (potentially infinite) set of candidates. In this respect, OT more closely resembles the Constraint-Based Phonology of Bird (1990) or the Declarative Phonology of Scobbie (1992b) than it does derivational approaches, in which constraints govern the application of rules or repair strategies in the course of a derivation, such as Calabrese (1988), Goldsmith (1990, 1991), Myers (1991), Paradis (1988a, 1988b), and Singh (1987).

The claim in OT that the output form is selected from a rich field of candidates represents a serious analytic commitment of this approach, one that at first glance seems difficult to achieve. For instance, when the constraint system CODA-COND >> FINAL-C is applied to a somewhat larger candidate set than we have considered previously, the outcome is ambiguous or even incorrect:

(i) Epenthesis of a default vowel instead of *r* deletion will also satisfy CODA-COND and violate FINAL-C. Thus, the candidate **Homerə left* is in an unresolved tie with the actual output *Homeɹ left*.
(ii) Worse yet, syncope of the final vowel satisfies both CODA-COND and FINAL-C. Thus, candidates like **Wandɑ left* and **Homɛɹ left* should be superior to the actual output of (17).

Within OT, it is necessary to rule out these other candidates by invoking additional constraints.

To deal with cases like (i) and (ii), Prince and Smolensky propose a purely constraint-theoretic interpretation of epenthesis and syncope that is in close agreement with most recent work in syllable theory. The fundamental idea is that epenthesis and syncope are not actual insertion and deletion operations on the segmental string, but rather they are special cases of the normal relation between prosodic and segmental structure. An epenthetic vowel is an empty syllable nucleus (Selkirk 1981:215), which is to be cashed in phonetically for a default vowel (Archangeli 1984:36). Likewise, a deleted segment is one that, though present in the segmental string, is not linked to prosodic structure, so it is "stray-erased" in phonetic interpretation (McCarthy 1979; Steriade 1982). No actual segments (melodemes) are deleted or inserted in the mapping between input and output forms; instead, the prosodic structure of the output form represents inserted vowels by empty nuclei and deleted vowels as unlinked to prosodic structure. Consonant deletion and epenthesis are treated similarly.

In this way, epenthesis and syncope can be conceived of as consequences of phonetically interpreting certain special configurations in phonological representation, rather than as procedures applied in the course of a derivation. These special configurations, empty nodes and stray segments, are themselves governed by the following constraints:

(19) FILL-V
Empty nuclei are prohibited.

(20) PARSE-V
Stray vowels are prohibited.

Thus, FILL-V, interpreted imperatively, is a prohibition on epenthetic default vowels, and PARSE-V is a prohibition on vowel deletion. It is by obeying or violating these constraints, rather than by applying or not applying some repair strategy, that the correct surface representation is obtained.

The impossibility of vowel epenthesis or syncope in **Homerə left* or **Wandɑ left* now has a straightforward constraint-theoretic explanation: both FILL-V and PARSE-V are active, ranked above FINAL-C in the English constraint hierarchy. The following tableaux show the comparison explicitly. An unfilled nucleus is indicated by '□'; a stray segment is overprinted with ○:

(21)

	Candidates	FILL-V	PARSE-V	CODA-COND	FINAL-C
	Homer left			*!	
⇒	Homeɹ left				*
	Homer□ left	*!			

(22)

	Candidates	FILL-V	PARSE-V	CODA-COND	FINAL-C
	Wandar left			*!	
⇒	Wanda left				*
	Wand○ left		*!		

In the absence of evidence for their relative ranking, FILL-V, PARSE-V, and CODA-COND are assumed to be ranked equally (indicated by the dotted line separating them). The relatively high ranking of FILL-V and PARSE-V appears to be a general property of English phonology, not limited to the case at hand. Apart from fast speech phenomena, syncope and epenthesis play a very restricted role in English phonology, being limited to the vowel/∅ alternations in weak plurals, genitives, and weak preterites.

Thus, the constraints FILL-V and PARSE-V exclude the ill-formed candidates in (i) and (ii), limiting epenthesis and syncope in a purely declarative way. But there is another, related set of problems that we have not yet addressed: What is the source of the epenthetic consonant *r*? What excludes epenthesis of a consonant other than *r*, such as *t* in **Wandat left* or **Wandat arrived*?

Within the context of the discussion above, the simplest answer to these questions would be to designate *r* as the default consonant of English. Then *r* would be represented phonologically as an empty node □, to be spelled-out phonetically as *r*. In this way, *Wandar arrived* would violate FILL-C though it would obey FINAL-C, indicating that FINAL-C dominates FILL-C in the constraint hierarchy. (This analysis also requires that CODA-COND be restated as a constraint on the distribution of □ rather than as a constraint on *r* since, by hypothesis,

r is phonologically absent.) The impossibility of *Wandat left/*Wandat arrived would follow from the simple fact that r, rather than t, is the designated default consonant of English.

The problem with this approach is that r is demonstrably not the default consonant in English.[10] There are three basic arguments against default status for r. First, if r is a true default consonant, then r epenthesis should be a common, natural phenomenon. In fact, all indications are that r epenthesis is unnatural, because epenthesis of r is always historically secondary to deletion of r, from which it derives by reanalysis (Vennemann 1972; McCarthy 1991). In contrast, epenthesis of a true default consonant like ʔ frequently develops spontaneously rather than through reanalysis. Second, if r is a default consonant by virtue of underspecification, it should be phonologically inert, since the featural underspecification of default consonants means that they can have little or no effect on adjacent segments. On the contrary, English r has profound effects on vowel quality, more than any other consonant. Before tautosyllabic r, the vowels ɪ, ə, and æ are backed (*fir*, *tern*, *car*), and ɪ and ə are rhotacized as well.[11] These facts entail that r be specified for both [back] and [coronal] at the point in the derivation when assimilation applies. Assimilation demonstrably applies early, in the lexical phonology, as shown by its failure to apply in postlexically truncated hypocoristics like *Cyr* [sɪr] from *Cyril*, *Jer* [dʒɛr] from *Jerry*, or *Lar* [lær] from *Larry* (Kahn 1976:189). Third, although r is a coronal and so could be underspecified for place (see Paradis and Prunet 1991), there is a considerable body of evidence against coronal underspecification in English (McCarthy and Taub 1993).

So r is not the default consonant of English. This means that the output form *Wandar arrived* must differ segmentally (melodically), rather than just prosodically, from the corresponding input form /Wanda arrived/. Thus, this form goes beyond the standard Optimality-Theoretic view of the candidate set as consisting of all possible melody-conserving prosodic rearrangements of the input. Melody is not conserved in *Wandar arrived*, so it is necessary first of all to broaden the candidate set to include this form.

Let us suppose that the grammar of this dialect contains a phonological rule of r insertion: $\emptyset \rightarrow r$. By a "rule" here I mean a phonologically arbitrary stipulation, one that is outside the system of Optimality. This rule is interpreted as defining a candidate set {*Wanda*, *Wandar*}, and this candidate set is submitted to the constraint hierarchy. That is, this rule enlarges the candidate set to include non-melody-conserving candidates like *Wandar arrived* (and **Wandar left*), which are then evaluated by the constraint hierarchy in the familiar way.

[10]Mester and Itô (1989:274–275) present several arguments for default r in Japanese, but they note that s also has a good claim on default status. In any case, the resemblance between Japanese r and English r is purely orthographic, not phonetic or phonological, since the former is the flap [ɾ] and the latter is the approximant [ɹ].

[11]Centralization of ʊ before r (*purr*) is a different process, since it applies even before heterosyllabic r (*hurry*, *[hʊrij]).

This proposal answers the questions raised about epenthetic r. First, the source of epenthetic r is a phonological rule of r insertion, where a rule is understood as a process that adds members to the candidate set. Second, the reason why **Wandat arrived* is impossible is that **Wandat* is not a member of the candidate set, since it is not melody-conserving and its membership in the set is not licensed by any special rule. The role of the rule $\emptyset \rightarrow r$ is to enlarge the candidate set in a very limited way, stipulating the phonologically unnatural phenomenon of r epenthesis.[12]

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[12]Why is epenthetic r found only when FINAL-C and not ONSET is violated? Perhaps the explanation for this is again historical, since r epenthesis developed from the reanalysis of final r deletion. In that case, it would be appropriate to make the r insertion rule context sensitive: $\emptyset \rightarrow r / \_\_ \#$. Alternatively, it may be the case that ONSET is not enforced by epenthesis at all in English. Certainly in the dialect described here the hiatus in *to Ed* is not relieved by any consonant (including glottal stop), and in other American English dialects the hiatus in examples like *sawing* is also perfectly good. Insertion of glottal stop into onsetless syllables seems to be restricted to phrase-initial position, perhaps more for phonetic than for phonological reasons.

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