Word-final onsets[*]

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Abstract

A word-final consonant is standardly assumed to occupy a syllable coda. An alternative is to treat it as the onset of a syllable containing a phonetically unexpressed nucleus. The final-onset analysis is shown to out-perform the final-coda analysis on a range of phonological phenomena, including syllable typology, stress, vowel length, and consonant phonotactics. A constraint-based implementation of the final-onset analysis provides a straightforward treatment of the typological facts.

1 Introduction

It is commonly taken as a matter of self-evident truth that any consonant following the last vowel of a word occupies a syllable coda. This assumption is contradicted by a substantial body of evidence, which we review here.

The final-coda view's empirical deficiencies are acknowledged in the notion that final consonants can be in some sense extrasyllabic, at least contingently. However, there is a more radical alternative — to take a final consonant to be the onset of a syllable containing a null vowel. This view is not so well established in current phonological theory, although it probably predates the final-coda assumption by some considerable period. The older view is supported by a substantial body of evidence, which we also review here.

One of the quite general questions raised by the final-onset view is whether prosodic structure contains positions — in this case syllabic nuclei — that are empty. By this we do not mean nuclei that are filled by non-lexical segmental material, one of the senses in which 'empty' is sometimes used (Prince & Smolensky 1993 *et passim*). We mean literally empty in the sense that the positions in question may, under certain circumstances, receive no phonetic interpretation at all — or at least not one that would warrant transcription in terms of an alphabetic vowel symbol.

The issues at stake here have to do with the very nature of syllable structure. They belong to a set of representational questions that seem to have drifted down the agenda in recent years, as phonologists have shifted their attention towards questions

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of derivation, broadly understood as the mapping between phonological input and output. It hardly needs saying, though, that matters of representation need to be kept continuously under review if we are not to be condemned forever to recycle the same flawed representational designs through ever more refined derivational mechanisms. The present paper reconsiders the representation of final consonants from an output-oriented viewpoint. It points out some the undesirable consequences of allowing certain traditional assumptions about syllable structure to pass unchallenged into constraint-based practice.

The first part of the paper weighs up the arguments for and against the final-coda and final-onset views, drawing on evidence from language typology, stress, vowel length, and consonant phonotactics. The second part proposes a constraint-based typology of syllabic systems that incorporates the final-onset analysis.

2 Final codas: why the west was wrong

2.0 This part of the paper starts with a summary of the differing assumptions underlying the final-coda and final-onset views (§2.1). §2.2 explains why a final consonant cannot be a coda and §2.3 why it must be an onset. §2.4 reconsiders the significance of the well-known segmental-distributional similarities between final consonants and internal codas. §2.5 presents a case for concluding that a final onset must be followed by an empty nucleus.

2.1 Final consonants: the eastern and western prospects

Neutrally construed, the term SYLLABIFICATION refers to the relation between segment strings and syllabic constituents. In practice, most work in phonology treats the link as a unidirectional relation in which syllable structure is read off segment strings. This essentially phoneme-centred view finds clearest expression in the assumption that syllabic structure is wholly or largely absent from lexical representations and is either constructed or mapped by rule (e.g. Vennemann 1972, Kahn 1976, Levin 1985, Itô 1986) or supplied by a phonological generator (e.g. Prince & Smolensky 1993).

In the usual implementation of this view, syllabification hugs the sonority contours of phoneme strings. In a given sequence of segments, each sonority peak assumes the status of the core or nuclear portion of a syllable, while any flanking sonority troughs form the margins of the nucleus. From this it follows that '[e]ach sonority peak define[s] a unique syllable' (Blevins 1995:207). In any given word, there are thus as many nuclei, hence syllables, as there are sonority peaks, and conversely there are no nuclei or syllables without sonority peaks.

A direct consequence of this view is the identification of word-edge consonants with syllable margins. Given a word containing just one sonority peak, it seems natural to assume that whatever precedes the peak must be an onset and whatever follows it must be a coda. Thus in the English word **blank**, *bl* and *ŋk* are the consonantal margins of the peak formed by *æ* and are therefore projected as an onset and a coda respectively. Proponents of this view generally take its validity for granted: as Blevins puts it (1995:209): '[i]n all languages, syllable edges correspond with word/utterance edges'.

The phoneme-centred approach yields a typology consisting of a small closed set of core syllables such as CV, V and CVC, which are widely distributed across the world's languages, and an essentially open set of more complex marked syllables. On this view, there is no principled limit to the number of consonants that can occur in complex onsets and codas. For example, the onset supposedly formed by the initial *fstr* cluster of Polish **wstręt** 'repulsion' happens to contain four, as does the coda supposedly formed by the final *rpst* of German **Herbst** 'autumn'. Five coda consonants might even be squeezed out of the final *mpfst* of **thou triumphst** (Whorf 1940).

If it really is true that 'syllable structure can be determined just from the segmental composition of a word' (Spencer 1996: 96), the question naturally arises as to whether syllables are necessary at all. Since the sequential specification of segments is a necessary and irreducible part of lexical entries, we might easily conclude that any generalisation about onset or coda clusters could be more economically framed in terms of word- or morpheme-structure conditions — precisely the view adopted in SPE. The only way of justifying the habilitation of syllable structure in phonological representation is to show that it enjoys some degree of autonomy from morphological structure. One step in this direction is to relinquish the assumption that onsets and codas slavishly mimic word edges. Within the phoneme-centred approach, this move has been accomplished by invoking additional syllabic configurations at word edges, especially at the right edge, where proposals have included such devices as the syllable appendix or suffix (Halle & Vergnaud 1980, Fujimura & Lovins 1978) and extrasyllabicity (Liberman & Prince 1977, Itô 1986; see Blevins 1995 for references). Even the use of these devices typically reveals only a grudging acceptance of the notion that word ends might not align neatly with syllable ends. Word-final extrasyllabicity, for example, was originally conceived of as no more than a way-station on a consonant's derivational road to surface coda status (see for example Itô 1986)

However, rather than immediately indulging this increase in the armoury of syllabic structures, we should first raise a fundamental question about the central premise of the phoneme-centred view: is it really the case that syllable structure is parasitic on segment strings? Consider for a moment the empirical consequences of making the conceptual switch to the alternative idea that syllable structure is defined independently of segment strings and word structure.

One immediate consequence is a rejection of the assumption that every syllabic position is necessarily occupied by a phoneme. That is, there is no initial reason to rule out the possibility that certain syllabic positions are devoid of segmental content. This allows us to maintain a highly restricted set of syllable types and to dispense with the complex non-core structures that the phoneme-centred approach sees as unsurprising, or at least necessary.

It is this alternative view of syllabic structure that we wish to explore in the present paper. Specifically, we will concentrate on the final consonant of the word: under the syllable-centred approach, this does not have to constitute a coda. We will claim that in fact it cannot. A survey of the main problems surrounding the final-coda view will set the scene for a discussion of how the syllable-centred approach leads us to view final consonants rather as onsets. Explicit arguments for this conclusion have appeared in print in various places (e.g. Selkirk 1981, Kaye 1990, Charette 1991, Gussmann & Kaye 1993, Burzio 1994, Harris 1994, Lowenstamm 1996, Piggott 1999). Nevertheless, we believe it is worth spelling them out again, now more fully, since they have gone largely unanswered in much of the recent literature on syllable theory. (For example, Blevins' (1995) otherwise extensive survey makes no reference to these arguments whatsoever.)

We start by placing the discussion in the broader historical context of two distinct linguistic traditions which have adopted quite different perspectives on the syllabification of word-final consonants. The final-coda view is part of an essentially 'western' or Graeco-Roman tradition running through work on versification and phonology. This is in contrast to a more ancient, 'eastern' tradition which maintains that a word-final consonant occupies the onset of a 'dull' syllable — one that lacks an audible nucleus.

The eastern view is perhaps most obviously embodied in syllable-based writing systems. By way of illustration, consider how the following modern Amharic words are represented in the Ethiopic *Fidäl* syllabary used for that language (as well as for Tigrinya, Oromo and classical Ge'ez among others):

(1)		Fidäl	Alphabetic	
	(a)	ና	*na*	'come'
	(b)	ቅና	*k'əna*	'honest'
	(c)	ቅን	*k'ən*	'day'

To appreciate the phonological thinking behind these orthographic forms, it is important to bear in mind that each *Fidäl* symbol stands for an entire syllable. Note how the symbol ና represents the syllable *na* in both (1)a and (1)b and how ቅ represents *k'ə* in both (1)b and (1)c. What strikes the eye is the way in which the symbol ን in (1)c represents the word-final *n*, implying that this consonant occupies a separate syllable from the preceding *k'ə*.

The assignment of a word-final consonant to the onset of a dull syllable is characteristic of all syllabaries. Besides *Fidäl*, examples include the family of *Brāhmī*-derived scripts, such as *Devanāgarī* (used for Sanskrit and Hindi, for example), Bengali, Gujarati, Telugu and Sinhalese. Other examples are Korean *Han'gŭl* and Japanese *Katakana* and *Hiragana*. In what follows, we will argue that this eastern tradition is founded on a fundamental insight into syllabic organisation that modern phonological theory would do well to embrace.

2.2 Against final codas

2.2.0 Before proceeding to a presentation of the positive evidence supporting the phonological status of dull syllables, we wish to clear the ground by reviewing some of the negative evidence against the final-coda view. The evidence we will focus on comes from three main areas — syllable typology, word stress, and vowel length.

2.2.1 VC typology

According to one common classification, languages divide into two main syllabic types: one permits only open syllables (the 'CV' type), while the other tolerates both open and closed syllables (the 'CVC' type). Inherent in the final-coda view are the typological predictions in (2).

(2) (a) Any CV language simultaneously lacks both internal codas and final consonants.
(b) Any CVC language simultaneously allows for both internal codas and final consonants.

Languages of the predicted sort are not difficult to find: for example, Zulu and Yoruba instantiate (2)a, while English and Polish instantiate (2)b. However, as Kaye (1990) points out, there are two other observed types that the classification fails to account for. One excludes internal closed syllables but allows final consonants; examples include Luo, Yapese (Piggott 1999) and Yucatec Maya. The other allows internal closed syllables but forbids final consonants – Italian, Axininca Campa (Payne 1981) and Telugu, for example.

Thus it seems that languages face two separate choices with respect to what we will call 'VC' typology: (i) whether or not to have word-internal codas, and (ii) whether or not to have word-final consonants. As tabulated below, the intersection of these two options defines four rather than just two different types of syllabic systems (•

indicates a syllable boundary).

(3)

<table>
<tr><td rowspan="2">Final VC]?</td><td colspan="2">Internal VC•?</td></tr>
<tr><td>No</td><td>Yes</td></tr>
<tr><td>No</td><td>Ia ...V•CV]
Zulu</td><td>IIa ...V(C)•CV]
Italian</td></tr>
<tr><td>Yes</td><td>Ib ...V•CV(C)]
Luo</td><td>IIb ...V(C)•CV(C)]
English</td></tr>
</table>

The four-way typology in (3) contradicts the predictions in (2). Moreover, it undermines the assumption that a domain-final consonant should automatically be equated with a domain-internal coda.

2.2.2 Stress

One fact has long made standard metrical theory uncomfortable with the final-coda view: in many stress systems, CVC counts as heavy when word-internal but as light when final. In other words, for stress purposes, the final consonant fails to contribute to the weight of the preceding syllable. Initially accounted for in terms of the formal device of consonant extrametricality (Hayes 1982), the phenomenon is now widely viewed as resulting from a misalignment between the right edges of words and syllables (Smolensky & Prince 1993 *et passim*).

A well-known example involves a sub-regularity governing stress-placement in English verbs: the final syllable attracts stress when it is heavy (that is, when its rhyme contains a complex nucleus or is closed by a consonant); otherwise it is the penultimate syllable that is stressed. The examples in (4)a and (4)b illustrate final stress, those in (4)c the penultimate pattern.

(4)	(a)	**tormént**	(b)	**cajóle**	(c)	**édit**
		lamént		**maintáin**		**astónish**
		collápse		**caróuse**		**cáncel**

The examples in (4)c clearly indicate that the final consonant fails to render the preceding rhyme heavy and thus stress-attracting. In the word **cancel**, *kæn* and *səl* are not equal from the viewpoint of stress; otherwise the latter would be stressed (presumably as **sə́l* or the like). Since this particular regularity does not take into account the word-final consonant, the relevant stress domains — feet — are represented as in the parenthesised portions of **tor(mén)t**, **ca(jó)le** and **(édi)t**. Similar examples can be provided from many languages (for an extensive list of citations, see Hayes 1995: 56ff.).

Extrametricality points to the negative conclusion that, for stress purposes, a word-final consonant does not count as a coda. On the face of it, we are prevented from elevating this observation to the status of a stress universal by the fact there are languages in which final consonants do reportedly contribute to the weight of the preceding rhyme. Whether these represent genuine counterexamples depends on whether they can be subsumed under some more general treatment of final-consonant metricality. We take up this issue in a later section.

2.2.3 Vowel length

2.2.3.0 Related to extrametrical behaviour is the failure of a domain-final consonant to influence the length of a preceding vowel. This too sets the consonant apart from an internal coda. Here we three review three length-based phenomena that illustrate this point — closed syllable shortening (§2.2.3.1), metrical lengthening (§2.2.3.2), and quantity-sensitive reduplicative affixation (§2.2.3.3).

2.2.3.1 Closed-syllable shortening: English. Under certain circumstances, a consonant is observed to force a preceding vowel to be short. A necessary condition on this occurrence is that the consonant form a coda. The phenomenon — closed-syllable shortening — can thus be expected to provide a useful test of whether a vowel and a following consonant occupy the same syllable.

In English, the ability of a syllable nucleus to support a length distinction is partially determined by the identity of a following consonant. Significantly, this constraining influence is evident in domain-internal consonants but not in those occurring finally (Myers 1987, Yip 1991).

Long nuclei in English are free to occur before a domain-internal onset, as in **final, Peter, lady, loiter**, etc. They can also be found before an internal coda (as in **council, shoulder**, etc.). But there are quite severe restrictions on the nature of the consonant that can appear in super-heavy VVC• combinations of this type. Specifically,

(5) (a) C must be a fricative or a sonorant, e.g. **pastry, oyster, danger, council, boulder, ancient** (**beypti, *aːkmi*);
(b) if sonorant, C must be homorganic with the following onset, e.g. **council, paltry** (**kawnbəl, *pɔːlbri*);
(c) in the case of (b), the place of C is (almost) invariably coronal (**kaympəl, *iːmpri*).

For summaries and discussion of these facts, see Selkirk (1982), Borowsky (1986), Harris (1994), and the references there.[1]

The vowel length contrast can also appear before a final consonant, the difference being that any consonant is allowed to appear after either a short or a long vowel. In other words, a final consonant imposes no systematic constraints on the length of the preceding vowel. Consider the examples below:

(6)	VC]	**lid, run, back, top, step, foot, fill, spliff, rich**
	VVC]	**slide, spoon, soap, rake, boot, feel, leaf, reach**

The differences between final (V)VC] and internal (V)VC• are further displayed in English alternations involving closed-syllable shortening, such as the following (cf. Myers 1987):

(7)	DOMAIN-FINAL	DOMAIN-INTERNAL
	perceive	**perceptive**
	describe	**description**
	scribe	**scripture**
	reduce	**reduction**
	five	**fifty**
	wise	**wisdom**
	intervene	**intervention**
	retain	**retentive**

The conditions under which the short-vowel alternants occur, namely when the vowel appears in an internal closed syllable, include those listed in (5). Significantly, no such shortening takes place before a word-final consonant.

The validity of closed syllable shortening as counterevidence to the final-coda assumption is quite independent of whether root-level alternations such as those in (7) are understood as involving derivation from common underlying forms (SPE *et passim*) or the evaluation of corresponding output forms (cf. Benua 1997, Burzio 2000). What is crucial is that the phonology of present-day English requires closed-rhyme shortness in specified output contexts. The failure to impose shortness before word-final consonants, which gives rise to the alternations in question, is quite at

[1]The patterns in (5) are only discernible if we are careful to exclude the complex segmental sequences that can arise through the juxtaposition of words, including within compounds, such as –*aypk*– in **typecast** or –*owmk*– in **homecare**. This point extends to any consonant sequence straddling a word boundary, irrespective of the preceding vowel-length restriction under discussion here. Such sequences, the product of morphosyntactic concatenation, are arbitrary in the sense that they are not subject to systematic phonological restrictions. We return to this point presently.

variance with the claim that a word-final consonant is a coda.

2.2.3.2 Metrical lengthening: Icelandic. Modern Icelandic displays the widespread phenomenon of metrical lengthening, the requirement that a stressed open syllable contain a long vowel (for extensive discussion see Árnason 1980, Gussmann 1985, 2000 and the references there). The overall result is that any stressed rhyme in Icelandic must be heavy, being composed of either VC or VV. One consequence is that a word-final stressed vowel must be long, as in the following examples:

(8)	*svoː*	‘so’	*θuː*	‘you’
	faiː	‘I get’	*fjɛː*	‘livestock’

Domain-internally, stressed vowels are long before single consonants, which clearly belong to the onset of the following syllable (see (9)a), and before clusters of two consonants which form complex onsets (see (9)b).

(9)	(a)	*fɛ́ːla*	‘hide’	*táːla*	‘speak’
		ráuːða	‘advise’	*jɛ́ːta*	‘devour’
		θɔ́ːla	‘tolerate’	*íːvɪr*	‘over
		síːmɪ	‘telephone’		
	(b)	*bɛ́ːtrɪ*	‘better’	*nɛ́ːpja*	‘cold weather’
		vǿːkva	‘water flowers’		
	(c)	*pánta*	‘order (vb.)’	*sénda*	‘send’
		má^{y}*ltɪ*	‘speak (pret.)’		

Before an internal coda, on the other hand, a vowel must be short, as in (9)c.

As described to this point, the Icelandic pattern is quite straightforward: stressed nuclei must branch in open syllables and must not branch in closed syllables. This unremarkable regularity encounters a major obstacle if a final consonant is deemed a coda: monosyllabic words ending in C] should constitute closed syllables and should thus only contain short vowels. In fact, the vowel is invariably long in such cases:

(10)	*taːl*	‘number’	*vɔːn*	‘hope’
	haiːð	‘height’	*θjouːð*	‘nation’
	røːk	‘cause’	*pɪːl*	‘moment’
	fɛːt	‘step’		

It is clearly desirable that we produce a uniform account of stressed vowel quantity that will subsume the long vowels of *ta:l* and *tá:la* under the same generalisation. Meddling with syllable boundaries is not a satisfactory solution, because some word-final two-consonant clusters allow a preceding vowel to be long, while others do not. If final consonants are to be assigned to codas, then we would be doubly hopeful of finding a short vowel before two consonants in this context. But a comparison of the long vowels in (11)a with the short in (11)b shows that this does not have to be the case (examples from Thráinsson 1994: 150).

(11)	(a)	*snʏ:pr*	'scolding'	*flɪ:sj*	'peeling'
		pʏ:kr	'secretiveness'	*sø:tr*	'slurping'
	(b)	*kʏmr*	'bleating'	*ɛmj*	'wailing'
		bølv	'cursing'		

The difference between the two sets of examples here can be shown to be related to the fact that the final clusters in (11)a coincide with well-formed internal complex onsets, a point we expand on below.

The conclusion which Thráinsson reaches with respect to Icelandic is the following: 'either we need a more sophisticated theory of syllables, namely one that does not consider final consonants and certain final consonant clusters part of the preceding syllable in some sense, or the length of stressed vowels in Icelandic does not depend on syllable boundaries' (1994: 150).

Thus, although Icelandic differs from English in exhibiting metrical lengthening, the vowel-length evidence points to the same conclusion in the two languages: word-final consonants do not affect the quantity of the preceding nucleus. In English, the vowel can be either short or long, exactly as domain-internally before a single (onset) consonant. In Icelandic, a stressed vowel before a word-final consonant is invariably long for the same reason as one occurring before a single internal consonant.

2.2.3.3 Reduplication: Ponapaean. The indifference of vowel length to the presence of a following word-final consonant is also to be seen in certain types of prosodic morphology. In Ponapaean, for example, the reduplicative progressive prefix exhibits a pattern of quantity-sensitive weight polarity that disregards a stem-final consonant (McCarthy & Prince 1986). The prefix is heavy (CVX) before a light stem syllable (see (12)a) and light (CV) before a heavy syllable (see (12)b).

(12)	STEM	PROGRESSIVE	
(a)	*pa*	*paa-pa*	'weave'
(b)	*pou*	*po-pou*	'cold'
(c)	*dod*	*don-dod*	'frequent'

The prefix is routinely heavy before CVC stems (see (12)c), indicating that the word-final consonant does not contribute to the weight of the preceding rhyme. (The segmental identity of the prefix-final consonant is determined by constraints on internal codas, which — a recurring theme this — are different from those on word-final consonants.)

2.2.3.4 Vowel length: summary. Like the typological and metrical evidence reviewed earlier, the vowel-length evidence discussed in this section is largely negative. The behaviour of closed-syllable shortening, metrical lengthening, and quantity sensitive affixation provides further support for the conclusion that final consonants are not codas. We turn now to positive evidence indicating that final consonants are in fact onsets.

2.3 Final onsets

2.3.0 There are at least two main reasons for taking seriously the proposition that a word-final consonant is an onset. One has to do with the phonotactics of word-final consonant clusters (§2.3.1). For the second, we turn again to the issue of preconsonantal vowel length (§2.3.2).

2.3.1 Final consonant clusters

Once a syllable template has been established for a given language, it would be naively reasonable to expect it to be as applicable word-internally as at word edges. At least that is the initial supposition we would be entitled to make on the basis of the view that syllable constituency enjoys independent structural status. In fact, this expectation is rarely met by western-style analyses of particular languages. What we typically find is that the set of possible consonant clusters allowed for in such templates far exceeds what is attested word-internally. For example, the orthodox notion that the English coda can contain up to four or even five consonants does not prepare us for the disappointment of discovering that morpheme-internal closed syllables typically contain at most one, as in **win•ter, shel•ter, af•ter, chap•ter**, etc. To press home the point that this is in fact the maximal pattern for internal codas requires a certain amount of argumentation, which we supply below. One reason for the mismatch is of course that morphological affixation can produce complex consonant clusters at word edges that never occur domain-internally.

In the case of English, a large proportion of the complex word-final sequences result from word-level suffixation, primarily involving the plural, present, past, and ordinal morphemes. These suffixes can in principle be appended to anything that is morphologically appropriate. That is, any regular verb can take a past tense form, any regular countable noun can attach a plural ending, and so on. Such processes produce a host of complex final sequences, including for example the *ltʃt, mpft, lmz, ntθs* of **belched, triumphed, films, thousandths**. One good reason for being suspicious of the claim that these constitute genuine tautosyllabic clusters is the fact that they are not permitted within roots; that is, there are no monomorphemic words containing any of these sequences (cf. Myers 1987). Moreover, consonant sequences straddling a word-level morpheme boundary are more or less unrestricted in the same way as are sequences that arise across words at sentence level. Note for example how the following word-final sequences have direct parallels with cross-word sequences:

(13)	WORD-LEVEL SUFFIXATION	SENTENCE LEVEL
	dreamed	**dream did**
	ringed	**ring David**
	seems	**seem zany**
	walked	**walk tall**
	boats	**boat sailed**

Word-level suffixation is thus little different from sentence-level concatenation in producing pseudo-clusters — combinations which reveal nothing about syllable-internal phonotactics. Any segment sequence crossing a word-level boundary results from a process of lexical insertion that is blind to phonological restrictions.

The appropriate place to establish systematic patterns is within root-level domains, most clearly within monomorphemic words. Once we inspect this portion of the vocabulary of English, we arrive at a very different picture from that painted by templates allowing for four or five coda consonants. The overwhelming pattern is that, shorn of word-level suffixes, English words can end in a maximum of two consonants. Typical final clusters are *nd, nt, lt, ld, pt, kt, mp, ŋk, st, ft* as in **sand, lent, halt, bold, apt, act, lamp, link, last, oft**.[2]

Should we then conclude that two is the limit for the English coda? This still leaves us with a template that makes provision for one more position than is found domain-

[2]Compared to this quite systematic pattern, the number of monomorphemic words ending in more than two consonants is vanishingly small, e.g. **text** (and derivatives such as **context**), **mulct** and (rhotic pronunciations of) **corpse**. Note that the third consonant in all these cases is a suffix-like coronal.

internally. One response has been to shave the supernumerary final consonant off the template through recourse to one of the exclusionary devices referred to above — for example, by assigning the consonant to a syllabic suffix or appendix (Fujimura & Lovins 1978, Halle & Vergnaud 1980), or by designating it as extrasyllabic (Itô 1986, Myers 1987). In serialist approaches, the latter dispensation only holds underlyingly; during the course of derivation the extrasyllabic consonant has to be incorporated into syllable structure proper, either into the preceding coda or into a following onset if one becomes available through morphological concatenation (see Blevins 1995 for references). In the first instance, this in effect results in the postulation of two templates — an underlying one allowing for a single coda consonant and a surface one allowing for two.

While extrasyllabicity has no formal representational status in more recent output-oriented theory, its effect can be simulated by means of a constraint interaction that forces the right edge of a final syllable away from the right edge of the word (see Prince & Smolensky 1993: ch 4). Under these ranking conditions, the traditional final-coda analysis is recapitulated in any non-optimal candidate displaying perfect right-edge alignment.

No matter whether they are implemented serially or by output constraint, both the final-coda and the extrasyllabicity analyses carry with them certain assumptions about the phonotactics of final two-consonant clusters that are difficult to square with the facts. To illustrate the problem, we will now consider final CC] combinations in four languages which all share the following trait: a significant set of the clusters in question obey the same phonotactic restrictions as internal coda-onset or complex-onset clusters.

Starting with English, note how four of the most systematic phonotactic patterns found in final CC] clusters are replicated in internal C•C clusters (examples from Harris 1994: 74):

(14)

	MEDIAL	FINAL		MEDIAL	FINAL
(a)	STOP-STOP		(b)	SONORANT-STOP	
	chapter	**apt**		**pamper**	**damp**
	vector	**sect**		**winter**	**flint**
				wrinkle	**rink**
				filter	**guilt**
				scalpel	**scalp**

	Medial	Final		Medial	Final
(c)	Fricative-stop		(d)	Sonorant-fricative	
	mister	**mist**		**cancer**	**manse**
	after	**raft**		**dolphin**	**golf**
	whisper	**wisp**		**whisker**	**whisk**

For the final-coda and extrasyllabicity approaches, the most damaging aspect of the parallel between domain-internal C•C and domain-final CC] is that it has to be viewed as totally accidental. The phonotactic regularities evident in both contexts have to be stated twice — once for internal coda-onset clusters and again either for two-consonant codas (the final-coda view) or for a coda followed by an unsyllabified C (the extrasyllabicity view). If anything, the extrasyllabicity approach fares even worse than the final-coda approach in this respect: it would lead us to expect no phonotactic dependencies at all to hold between the members of a final C<C>$_{es}$ sequence.

Modern Irish admits a rather more constrained set of internal and final clusters than English (Ó Siadhail & Wigger 1975: 68 ff). The same point is clear, however: as exemplified in (16), whatever is found word-finally also shows up as an internal coda-onset sequence.

(15)

	Medial		Final	
Sonorant-stop				
rp	**torpa**	'clod'	**corp**	'body'
rt	**gorta**	'hunger'	**gort**	'field'
lt	**rialta**	'regular'	**oscailt**	'open'
lk	**folca**	'flood (n. pl.)'	**folc**	'flood (n. sg.)'
rd	**garda**	'police'	**bord**	'table'
ŋg	**rangaigh**	'classify'	**long**	'ship'
Fricative-stop				
χt	**donachta**	'badness (gen.)'	**donacht**	'badness (nom.)'
st	**postaire**	'messenger'	**post**	'post'
sk	**taoscach**	'gushing'	**taosc**	'drain'

The parallel between the phonotactics of final CC] and internal C•C in both English and Irish adds further to the body of negative evidence we have accumulated against the final-coda view. But it goes beyond this by providing us with our first positive indication of an alternative syllabification: a word-final consonant is an onset.

If we make this assumption, the phonotactic parallel just outlined falls out automatically: a word-final CC] cluster behaves just like an internal coda-onset cluster because it IS a a coda-onset cluster. Since this means that internal –C•C– and final –C•C] clusters are syllabically identical, the phonotactic generalisations illustrated above for English and Irish need only be stated once. Below we supply representations for the English pair **mister – mist** and Irish **gorta – gort**. Since the relevant structures are syllabically identical, the same set of syllabic representations will do for both languages.

(16) (a) Internal coda-onset C•C
mister, gorta

```
    R
    |\
 O  N \    O  N
 |  |  \   |  |
[x  x   x  x  x]
 |  |   |  |  |
 m  ɪ   s  t  ɚ
 g  o   r  t  ə
```

(b) Final coda-onset C•C]
mist, gort

```
    R
    |\
 O  N \    O  N
 |  |  \   |  |
[x  x   x  x  x]
 |  |   |  |
 m  ɪ   s  t
 g  o   r  t
```

Assigning a final consonant to an onset begs the question: what is it the onset of? For the time being, we will simply assume that it is the onset of a syllable that is well-formed to the extent that it contains a nucleus, albeit one that remains silent (hence the final empty position (17)b). It is important to note that none of the evidence we have presented to this point has any direct bearing on this particular issue, which we take up below.

One question we are in a position to answer right away is whether both members of a final two-consonant cluster could inhabit the same onset. Since complex onsets are found word-initially (**bring, clutter**) and word-medially (**algebra, umbrella**), we should expect them also to turn up word-finally. The prediction is indeed borne out, but only by some languages. While neither English nor Irish tolerates clusters of this type, there are languages such as Polish and French which do. These languages show two types of word-final CC cluster. One, exemplified in (18), follows the English and Irish C•C pattern illustrated in (17).

(17) (a) POLISH

ba[*rk*]	'shoulder'	**wi**[*lk*]	'wolf'
ka[*nt*]	'edge'	**la**[*mp*]	'lamp (gen. pl.)'
ska[*rp*]	'treasure'		

(b) FRENCH

po[*rt*]**e**	'door'	**lou**[*rd*]**e**	'heavy (fem.)'
ba[*rb*]**e**	'beard'	**Prou**[*st*]	

The other type replicates the complex-onset pattern encountered word-initially and medially. Compare the following initial and final clusters in Polish (final devoicing and some other processes disregarded):

(18)

	WORD-INITIAL		WORD-FINAL	
tr	**trawa**	'grass'	**jesiotr**	'sturgeon'
dr	**droga**	'road'	**wydr**	'otter (gen. pl.)'
bw	**błądzić**	'err'	**zasłabł**	'he fainted'
dw	**długi**	'long'	**zbladł**	'he grew pale'
tw	**tłusty**	'fat'	**zamiótł**	'he swept'
fl	**flądra**	'flounder'	**trefl**	'clubs'
fr	**fraza**	'phrase'	**szyfr**	'code'
kl	**kląć**	curse'	**cykl**	'cycle'
kr	**kret**	'mole'	**akr**	'acre'
gw	**głowa**	'head'	**biegł**	'he ran'

The same situation obtains in French:

(19)

	WORD-INITIAL		WORD-FINAL	
br	**bras**	'shoulder'	**sabre**	'sabre'
tr	**trou**	'hole'	**vitre**	'pane'
dr	**drap**	'drape'	**poudre**	'dust'
gr	**gris**	'grey'	**maigre**	'slim'
vr	**vrai**	'true'	**pauvre**	'poor'
kl	**clou**	'nail'	**boucle**	'buckle'
fl	**flotte**	'fleet'	**soufle**	'breath'
bl	**blanc**	'white'	**lisible**	'legible'
pl	**plaisir**	'pleasure'	**peuple**	'people'

(For further exemplification and discussion of the French facts, see Charette 1991 (120 ff); for Polish, see Gussmann & Cyran 1998).

The exact phonotactic parallels exhibited by the pairs of clusters in (19) and (20) come as no surprise if we assume they obtain in precisely the same syllabic configuration, namely a complex onset (cf. Charette 1991). This is illustrated by the medial and final clusters below:

(20) (a) Medial complex onset
souffler 'to blow'
katedra 'cathedral'

```
   O  N  O    N
   |  |  |\   |
   x  x  x x  x]
   |  |  | |  |
   s  u  f l  e
...t  e  d r  a
```

(b) Final complex onset
souffle 'breath'
katedr 'cathedral (gen. pl.)'

```
   O  N  O   N
   |  |  |\  |
   x  x  x x x]
   |  |  | |
   s  u  f l
...t  e  d r
```

Any account which treats final clusters of this type as codas faces two main difficulties. Firstly, it is problematic on theory-internal grounds: the rising sonority slope of these clusters is precisely the opposite of the direction otherwise associated attributed to coda clusters, illustrated by the examples **damp** in (15) and Irish **corp** in (16) (cf. Selkirk 1982, Clements 1990). Secondly, the final-coda account completely misses the fact that, phonotactically, these domain-final clusters have direct domain-internal counterparts.

Since Polish and French accommodate both final coda-onset and final complex-onset clusters, we expect these patterns to occur in combination, resulting in final C•CC] clusters. This is exactly what we do find: for example, French **arbre** *arbr* 'tree', Polish **cha**[*ndr*] 'blues (gen. pl.)', **fi**[*ltr*] 'filter', **ma**[*rtf*] 'worry (imp.)'.

The phonotactic facts taken from the four languages just discussed strengthen the conclusion that the second member of a final CC cluster cannot be a coda. Only the first member of such clusters may have this status, a pattern encountered in all four languages. Alternatively, the first member may occur as the lefthand position of a complex onset, a pattern permitted in Polish and French. In either event, the second member of a final CC cluster can only belong to an onset.

2.3.2 Final onsets and vowel length

Having concluded that final CC] syllabifies as either a coda-onset cluster or as a complex onset, suppose we now make the further claim that ANY final consonant — including singletons — occupies an onset. In this way, we readily capture the extra-rhymal behaviour of this position with respect to vowel length and stress assignment.

Taking length first, consider again the English closed-rhyme shortness facts introduced above. Recall that domain-internally in English there are severe restrictions on the character of the rhymal consonant that can follow a branching nucleus (the **pastry, poultry, shoulder** examples in (5)). Absolutely no such restrictions are found for word-final consonants. This is why pairs such as **lid – lead** abound in English (see the examples in (5)). If word-final consonants are codas, this asymmetry remains unexplained. If, on the other hand, word-final consonants are onsets, then the arbitrariness disappears: the general pattern is that a short or a long vowel is free to appear before a single consonant in the onset of the following syllable. It matters not whether this onset occurs domain-internally, as in **litter – litre, villain – silent, beckon – bacon** (see (22)a), or finally, as in **bit – beat, pill – pile, wreck – rake** (see (22)b).

(21) (a) **pepper** **paper**

```
 O N O N         O N   O N
 | | | |         | |\  | |
[x x x x]       [x x x x x]
 | | | |         | | | | |
 p ɛ p ɚ         p e y p ɚ
```

(b) **tip** **tape**

```
 O N O N         O N   O N
 | | | |         | |\  | |
[x x x x]       [x x x x x]
 | | |           | |/  |
 l ɪ d           l i   d
```

Alternations involving closed-syllable shortening, illustrated in (7), tell exactly the same story: the vowel of a morphological root must be short before an internal coda (as in **perceptive, fifty**) but can be long before a final consonant (**perceive, five**). If the final consonant is a coda, we have no obvious explanation for this asymmetry. If the final consonant is an onset, the failure to shorten before a single word-final consonant is exactly to be expected: shortening takes place before a coda and not before an onset.

The occurrence of closed syllable shortening before word-final two-consonant clusters is also expected, since we have established that the first of these consonants occupies a coda in English (as per the arguments outlined in §2.3.1 above). Hence alternations such as the following:

(22)

VV•C]	VC•C]
keep	**kept**
deep	**depth**
wide	**width**
leave	**left**
five	**fifth**
thief	**theft**

The following representations illustrate the difference between alternants displaying length before a single final consonant (as in (24)a) and those showing closed-rhyme shortness (as in (24)b and (24)c).

(23) (a) **five** (b) **fifth** (c) **fifty**

```
   R                 R                 R
   |                 |\                |\
 O N   O N         O N \   O N       O N \   O N
 | |\  | |         | |  \  | |       | |  \  | |
[x x x x x]       [x x   x x x]     [x x   x x x]
 | | | |           | |   | |         | |   | | |
 f a y v           f ɪ   f θ         f ɪ   f t i
```

Turning once again to Icelandic, we may now note that the vowel-length problem posed in §2.2.3 has a straightforward solution which accords with the generalisation that, in this language, stressed vowels must be long in open syllables. Under the final-onset view, VVC] forms such as those in (25)a have long vowels for exactly the same reason as forms such as those in (25)b and (25)c: in all instances, the stressed vowel occurs in an open syllable, whether this be in absolute final position (as in (25)b) or is followed by an onset (as in (25)a and (25)c). In the latter case, it is irrelevant whether the onset is domain-internal (as in (25)c) or final (as in (25)a).

(24) (a) VV•C]

ta:l	'number'	*vɔ:n*	'hope'
hai:ð	'height'	*θjou:ð*	'nation'
rø:k	'cause'	*pɪ:l*	'moment'
fɛ:t	'step'		

(b) VV•]

svo:	'so'	*θu:*	'you'
fai:	'I get'	*fjɛ:*	'livestock'

(c) VV•CV

fɛ́:la	'hide'	*tá:la*	'speak'
ráu:ða	'advise'	*jɛ́:ta*	'devour'
θɔ́:la	'tolerate'	*í:vɪr*	'over
sí:mɪ	'telephone'		

We also noted earlier that vowels before final CC] in Icelandic are short before certain clusters and long before others. If we assume that Icelandic is like Polish and French, but unlike English and Irish, in allowing word-final complex onsets, a long vowel is required in words such as those in (26)a for the same reason as in words containing an internal complex onset, such as those in (26)b.

(25) (a) VV•CC]

snʏ:pr	‘scolding’	*flɪ:sj*	‘peeling’
pʏ:kr	‘secretiveness’	*sǿ:tr*	‘slurping’

(b) VV•CCV

bɛ́:trɪ	‘better’	*vǿ:kva*	‘water flowers’
nɛ́:pja	‘cold weather’		

To summarise, metrical lengthening in Icelandic comes in four different segmental flavours: VV•CV, VV•C], VV•CCV and VV•CC]. As illustrated in (27)a, these contexts instantiate a single syllabic configuration, namely a stressed nucleus branching in an open rhyme.

(26) (a) *fɛ́:la* ‘hide’

```
   R     R
   |     |
 O N   O N
 | |\  | |
[x x x x x]
 | |/  | |
 f ɛ   l a
```

vɔ:n ‘hope’

```
   R     R
   |     |
 O N   O N
 | |\  | |
[x x x x x]
 | |/  |
 v ɔ   n
```

nɛ́:p^h*ja* ‘cold weather’

```
   R       R
   |       |
 O N   O   N
 | |\  |\  |
[x x x x x x]
 | |/  | | |
 n ɛ   p j a
```

sø:tr ‘slurping’

```
  R       R
   |       |
 O N   O   N
 | |\  |\  |
[x x x x x x]
 | |/  | |
 s ø   t r
```

(b) *pánta* ‘order’

```
   R
   |\
 O N \   O N
 | |  \  | |
[x x   x x x]
 | |   | | |
 p a   n t a
```

kʏmr ‘bleating’

```
   R
   |\
 O N \   O N
 | |  \  | |
[x x   x x x]
 | |   | |
 k ʏ   m r
```

As illustrated in (27)b, the other type of stressed constituent is a closed rhyme containing a non-branching nucleus, under which the segmental strings VC•CV and

VC•C] are subsumed. The significant point about the metrical generalisation embodied in (27) is that a final consonant behaves just like an internal onset rather than a coda.

2.4 Final consonants as weak segmental licensers

The phonotactic evidence discussed in the foregoing section leads us to reconsider what is perhaps the most familiar reason for taking word-final consonants to be codas – their tendency to pattern with internal codas in matters of segmental phonology. Indeed, the fact that specific allophonic or neutralising processes can target the two contexts simultaneously was seized on as a good reason for recognising codas or rhymes in the first place (Kahn 1976, James Harris 1983).[3] More generally, the two contexts share a diminished ability to support segmental contrasts, lending credence to the view of the coda as a weak segmental licenser (Prince 1984, Itô 1986, Goldsmith 1989, Rice 1996).

The main point we wish to make in this section is that the segmental-distributional motivation for uniquely unifying final consonants and internal codas is much less convincing than is generally assumed. Weak segmental licensing is characteristic of a broader range of contexts than can be accommodated by syllable-internal constituency, involving domains such as the foot and the word.

The segmental parallels between final consonants and internal codas are by no means exact, and certainly not as exact as commonly supposed. This is even true of some of the languages most often cited as illustrating the weak licensing power of codas. A case in point is Lardil (Hale 1973): here, coronal is the only place specification that can be independently supported by internal codas and final consonants (Itô 1986, Piggott 1999). Any other place specification appearing in the internal position is assimilated from the following onset. However, there are segmental differences between the two positions that cannot simply be attributed to the fact that one but not the other is followed by an onset. Within the confines imposed by the coronal restriction, the final position allows for a greater range of consonants. Unlike the internal position, it allows for a plosive (e.g. *yarput* 'snake/bird') and for contrasts between laminals and apicals. Similar cases in which the distributional profile of final consonants approaches but does not merge with that of internal codas include Selayarese and Kiribatese (both discussed by Piggott 1999).

That is not to deny the segmental similarities between internal codas and final consonants. The dissimilarities might be dismissed as of minor significance in the face

[3]Piggott (1999) notes that final consonants pattern segmentally with internal codas in some languages but not others, citing this as support for a hybrid model in which the syllabification of final consonants varies cross-linguistically between coda and onset.

of the generally reduced contrastive potential they exhibit compared to, say, word-initial onsets. The problem, however, is that this reduced potential is by no means unique to the two positions in question. It is also shared by internal onsets. Some of the most dramatic illustrations of this pattern are to be found in languages of the Xhoisan family.

In Žu|'hõasi, the size of the lexical stem is subject to the canonical limit defined in (28)a (Snyman 1975). Examples of stems contained within this limit are given in (28)b (accents mark tone).

(27) Žu|'hõasi

(a) [C_1VVC_2V]

(b)	CV	*/à*	'oopsprei'	CVCV	*dābà*	'elend'
	CVV	*≠āà*	'vlakte'	CVVCV	*/ōarà*	'voltooi'
	CVC	*xàm*	'sny'			

(c) (i) C_1

Plosives	12
Affricates	18
Clicks	47
Continuants	9
Nasals	2
Total C_1	88

(ii)

C_2V	4	*ß*	*r*	*m*	*n*
C_2]	2			*m*	*ŋ*

As set out in (28)c.i, the stem-initial onset (C_1 of the template in (28)a) boasts an array of 88 consonantal contrasts. C_2, meanwhile, supports four when prevocalic and just two when final (see (28)c.ii).

An even greater distributional imbalance occurs in !Xóõ, another Khoisan language (Traill 1985). Here, stems fall into the three bimoraic shapes defined in (29)a.

(28) !Xóõ

(a) [C_1VV] [C_1VC_2V] [C_1VC_2]

(b)	(i)	C_1	Clicks	80							
			Non-click stops	27							
			Other	6							
			Total C_1	113							
	(ii)	C_2V	6		*ß*	*l*	*y*	*m*	*n*	*ɲ*	
		$C_2]$	2					*m*	*n*		

The maximal system of 113 consonantal contrasts, supported by the stem-initial onset C_1 (see (29)b.i), contracts in C_2 to six when prevocalic and to two when final (see (29)b.ii).

The main relevant point about these two Khoisan cases is that wholesale neutralisation of consonantal contrasts simultaneously targets final position and intervocalic onsets. If the final position is treated as a coda, then the two contexts cannot be unified in syllabic terms – unless the intervocalic consonant is allowed to resyllabify into the coda of the preceding rhyme, contra onset maximisation. But, in the absence of word-internal consonant clusters, there is no independent evidence that either language has internal codas. In any case, as discussed below, there are good grounds for rejecting any resyllabification of this sort.

The affinity between intervocalic onsets and final consonants can also be observed in languages that have clear evidence of internal codas in the form of heterosyllabic consonant clusters. English is a case in point, although the relevant evidence is not often interpreted in these terms. Standard accounts of English syllable structure tend to take it for granted that there exists a distributional relation between final consonants and internal codas. However, in the absence of cross-linguistically widespread neutralising effects such as obstruent devoicing and coronal place restrictions, the distribution of final consonants in English is relatively free, and this makes them at least as similar to internal onsets as to internal codas.

Indeed, final consonants turn out to be significantly MORE similar to internal onsets if the data on internal codas is more tightly controlled than is usual in much of the relevant literature. To see this, take for example Hammond's presentation of the segmental-distributional evidence on English internal codas (1999: ch 3). Many of his examples, including those given in (30), contain heterosyllabic clusters separated by a foot boundary.

(29) **magpie, abdomen, asbestos, nosegay, hodgepodge, kohlrabi, tomtit, humdinger, comrade, amnesia**

In these examples, as in many others provided by Hammond, the foot boundary corresponds to a word-level juncture with varying degrees of morphological transparency, ranging through near-productivity, historical fossilisation, and **cranberry**-type morphology

Once we limit our focus on internal heterosyllabic C_1C_2 pairs to foot-internal contexts, we discover that the distributional freedom enjoyed by C_1 shrinks to an extent that is more in keeping with the notion of the coda as a weak segmental licenser. One result is that it is difficult to find examples of the consonant clusters in (30) that are juncture-free and tautopedal (**mǽgpi*, **hʌ́ǰpi*, **hʌ́mdi*,...). Some of the C_1 consonants only occur in the coda of a tautopedal cluster when homorganic with the onset, i.e. when the onset licenses the place specification (as in **whim•per, clam•ber**). Others – *g, b, z, ǰ*, for example – are pretty much excluded from this context altogether.

Given the well-known connection between feet and words in English, it is perhaps not surprising that any consonant in absolute word-final position can also show up word-internally in foot-final position. Thus, rather than doing anything to establish the distributional profile of internal codas, the range of C_1 consonants in examples such as those in (30) simply reflects the fact that word-level juncture does not necessarily coincide with absolute word finality. Moreover, it underlines the point that word-final consonants in English are very similar to initial and internal onsets in enjoying a high degree of distributional freedom. All of the C_1 consonants in (30) also occur freely in initial and internal onsets.

As noted above, extending a coda-based analysis to the segmental-distributional relation between final consonants and internal onsets involves recourse to resyllabification: the internal consonant is captured into the coda of the preceding syllable (Kahn 1976 *et passim*). (Whether this operation is understood as preserving the consonant's basic affiliation to the onset (yielding ambisyllabicity) or not has no bearing on the present discussion. In an output-oriented framework, resyllabification is simulated by allowing a VC•V candidate to defeat a V•CV competitor.) This expedient is widely employed in the analysis of one of the most studied regularities in English phonology, stop allophony (see Harris (1994) for a fully referenced summary of the extensive literature on this topic).

Consider for example two types of *t*-lenition in English, tapping and glottalling, both of which are standardly treated in these terms. Tapping is said to occur in a prevocalic coda, as in **ci**[*ɾ*]**•y**, **ge**[*ɾ*]**• a**, while an unreleased stop appears in a prepausal or preconsontantal coda, as in **ge**[*t˺*]**• me**. Glottalling meanwhile occurs in any type of coda, as in **ci**[*ʔ*]**•y**, **ge**[*ʔ*]**• a**, **ge**[*ʔ*]**• me**. The resyllabification has to be made sensitive to stress: codas are only captured by stressed syllables. Amongst other things, this correctly prevents reduction from affecting pre-stress word-internal onsets (hence the absence of tapping in, say, **retáin**).

There are many reasons for rejecting the device of coda capture. To keep things brief, let us consider just two of these (for more extensive discussion, see Harris (in press), Jensen (2000), and the references there).

One undesirable consequence of coda capture is that it necessitates a contradictory treatment of consonant reduction and vowel reduction. Vowel reduction targets weak syllables; hence the extensively contracted subsystem that occurs in unstressed syllables in English. To prepare a consonant for reduction, coda capture manoeuvres it into a strong syllable – precisely where vowels resist reduction.

Another problem with coda capture concerns the question of whether it is considered to be constrained by the weight of the preceding syllable. If it isn't, it creates internal superheavy syllables, as in *ley•zi* > *leyz•i* **lazy**. (cf. Wells 1990). Trimoraic syllables are doubly problematic. First, they violate the otherwise general principle of maximal rhyme binarity. Second, they are poorly motivated outside the capture site; compare the situation there with that obtaining word-finally, where, as discussed above, a consonant behaves extra-rhymally. The alternative is to maintain maximal binarity by assuming that an onset can only be captured into a preceding light syllable (cf. Giegerich 1992, Hammond 1999). This approach runs into its own empirical difficulties, since it wrongly predicts that intervocalic consonant reduction should only occur after a short vowel. In fact, both tapping and glottalling are blind to syllable weight; reduction affects, for example, **Peter** (long) as much as **city** (short).

What the examples discussed in this section help establish is that, outside of certain prosodically strong positions, there is a range of contexts that behave as weak segmental licensers. That is, they fall prey to systemic contractions that are disfavoured in strong contexts, such as the initial position in the word, stem, or foot (cf. Beckman 1997). The combination of two of the weak contexts, word-final and internal preconsonantal, is standardly used to justify a coda analysis. A weak third context, intervocalic, can only be incorporated under this account by resorting to the poorly motivated device of coda capture.

The scope over which these positional asymmetries extend is evidently larger than the syllable. In many cases, it is clear that the domain involved is the foot. Various analyses of English consonant reduction have shown how explicit reference to foot structure allows us to dispense with resyllabification (Kiparksy 1979, Harris 1997, Jensen 2000). Segmental licensing potential is greatest in the foot head – the dominant nucleus and its onset. Outside of this context, all positions are potentially weak segmental licensers. Thus, *t* in English remains unreduced when in the foot head (see (31)a) but is susceptible to tapping, loss of release and/or glottalling in weak foot contexts (see (31)b) (relevant foot domains parenthesised).

(30)	(a) Plosive:	**(time), bou(tique)**
	(b) Unreleased/glottal stop:	**(get)** ‖, **(get) Carl**
	Tap/glottal stop:	**(letter), (get) on**

Foot-based segmental asymmetries of this sort are by no means peculiar to English. Nor are they restricted to languages with stress prominence, as the Khoisan cases discussed above bear witness (for other language examples, see Harris 1997 and in press). Note how the Khoisan stem templates in (28)a and (29)a conform to trochaic foot design with respect to both quantity and the left-skewed distribution of segmental contrasts.

To summarise this section: in terms of their segmental-distributional behaviour, final consonants can pattern either with internal codas or with internal onsets or with both. What potentially unifies these positions is their location within the weak sector of domains such as the foot, stem, or word. Weak segmental licensing thus does not provide strong evidence either way for a coda or onset analysis of final consonants.

2.5 Final dull syllables

2.5.1 Empty nuclei

We are now in a position to address the issue of final empty nuclei. The notion of empty syllabic positions is not a new one in modern phonological theory. There is the precedent of empty onsets, invoked for example in the treatment of French *h-aspiré* (Clements & Keyser 1983). In spite of having no phonetic expression, these positions betray their presence in various phonological ways — in the *h-aspiré* case by blocking elision and liaison.

The syllabic evidence we have reviewed to this point is of two types: one leads us to reject the notion that final consonants are codas, while the other encourages us to embrace the notion that they are onsets. It is important to note that each of these conclusions is independent of any decision we might come to regarding empty nuclei. Neither stands nor falls by what we are about to say next.

There are good reasons to assume that any syllable onset must be supported by a following nucleus — a conclusion embodied in the assumption that the constraint NUC is universally undominated (Prince & Smolensky 1993). For one thing, this allows us to maintain a more restrictive theory of syllable structure than one that would countenance stray constituents. If a final consonant occupies an onset, we are then driven to the conclusion that this must be followed by a nucleus, albeit a silent one. In other words, we have arrived at the eastern notion of a final dull syllable.

Structurally, there is nothing unusual about a dull syllable: it contains an onset position licensed by a nuclear position. To label it ‘degenerate’ (cf. Selkirk 1981, Harris 1994, Piggott 1999) only makes sense from the viewpoint of the phoneme-centred view described in §2.1: a dull syllable is only phonemically unusual, in that it has no segmental content. Nevertheless, it is natural to ask whether empty nuclei display any of the properties associated with 'ordinary' nuclei. We now explore two respects in which this can indeed be considered true: empty nuclei are fully integrated into metrical structure (§2.5.2) and, under certain circumstances, can achieve phonetic expression (§2.5.3).

2.5.2 The metricality of empty nuclei

The notion that there exist metrifiable entities that are nevertheless silent has long been part of the Graeco-Roman tradition of versification. It is inherent in the device of catalexis, described in standard works on verse structure and adopted in modern phonology(see Abercrombie 1971, Giegerich 1985, Kiparsky 1991). As traditionally used, this refers to a silent stress — in musical terms a rest — which must be counted at the end of a line of verse in order for it to scan.

It has been proposed that a dull syllable can contribute a catalectic beat to the right edge of a word by forming the weak member of a trochaic foot (Burzio 1994, Harris 1997, Rowicka 1999). To illustrate, consider the unmarked location of stress in Spanish — penultimate in words ending in a vowel (as in (32)a) and final in words ending in a consonant (as in (32)b).

(31)	(a)	**patáta**	'potato'	(b)	**Madríd**	
		palóma	'pretty'		**jamón**	'ham'
		camisa	'shirt'		**papél**	'paper'

Under a standard final-coda account, a moraic trochee falls at the right edge of the word, either distributed over two light syllables (e.g. **pa(táta)**) or contained within a single heavy syllable (e.g. **ja(món)**) (see for example James Harris 1983). This analysis apparently contradicts the claim, tentatively made in §2.2.2 above, that a word-final consonant never contributes to the weight of a preceding syllable. It seems to suggest that a final consonant can behave metrically as a coda in at least some languages. (Manam presents a similar case; see Hayes 1995, Piggott 1999.)

The most straightforward interpretation of the same facts from a final-onset perspective is to assume that a final empty nucleus in Spanish is metrified in exactly the same way as a final unstressed nucleus (cf. Burzio 1994). The right-edge trochee is uniformly bi-nuclear, irrespective of whether the weak nucleus is sounded (e.g. **pa(táta)**) or not (e.g. **ja(mónØ)**). On this analysis, Spanish stress does not contradict the notion that a final consonant never contributes to the weight of a preceding syllable for the simple reason that weight is not involved in this case.

At least as far as this particular example is concerned, there is probably little to choose between the final-coda and final-onset analyses. However, when we widen the comparison to include other trochaic systems, we discover that recognising empty nuclei leads to a significant simplification of metrical theory. Specifically, it allows us to subsume what elsewhere has been treated as consonant extrametricality under syllable extrametricality.

One of the motivations for consonant extrametricality is that it enables us to maintain a straightforward interpretation of quantity sensitivity (see Hayes 1995 for discussion and references). In cases such as **édit**, designating the final consonant as extrametrical accounts for its failure to render the preceding rhyme heavy and thus stress attracting. In cases such as **tormént**, consonant extrametricality still leaves the preceding rhyme heavy and thus stressed, thereby heading off the awkward conclusion that there exist extra-superheavy syllables, restricted to word ends. One of the motivations for syllable extrametricality, meanwhile, is that is helps maintain foot binarity, for example in cases of antepenultimate stress such as **Cánada** (again see Hayes 1995).

Under a final-dull-syllable analysis, consonant extrametricality reduces to syllable extrametricality (cf. Burzio 1994): a final weak syllable is unfooted not just in examples such as **(Cána)da,** where the nucleus is sounded, but also in **(édi)tØ,** where the nucleus is silent.

Recognising metrifiable dull syllables offers an interesting take on the rather awkward mismatch between different uses of the term RHYME in syllable theory and versification. Of the two traditionally distinguished types of verse rhyme, the masculine type is defined as holding between words that end in a stressed monosyllable, as in **cook – book**, **collect – direct**. Feminine rhymes are defined as holding between words in which one or more unstressed syllables follow a stressed one, as in **elation – nation**, **merrily – verily**. On the standard final-coda view, a phonological rhyme corresponds only to a masculine verse rhyme; that is, word-final identical consonants qualify as both phonological and verse rhymes. A feminine verse rhyme, on the other hand, corresponds to a phonological frame consisting of a stressed rhyme followed by at least one unstressed syllable — in other words, a trochaic foot (cf. van der Hulst 1984). The disparity in usage is at best odd and rarely acknowledged in the standard literature.

On the final-onset view, ALL verse rhymes are defined over phonological feet. The main difference between the masculine and feminine types boils down to the matter of whether or not the weak nucleus of the foot is phonetically expressed: in feminine rhymes it is (as in **pla(cénta) – ma(génta)**), while in masculine rhymes it is not (as in **pre(téndØ)** – **de(féndØ)**). Syllabically and metrically speaking, all verse rhymes are feminine. This is consistent with the conclusion that feet are universally feminine, i.e. minimally binary (cf. McCarthy & Prince 1986).

2.5.3 The non-emptiness of empty nuclei

According to the phoneme-centred view of syllable structure outlined in §2.1.1, a nucleus is occupied by a segment that forms a local sonority peak or, put crudely, that is transcribable by means of an alphabetic vowel symbol. The nearest an empty nucleus could get to achieving phonetic interpretation in this sense would be to participate in segmental alternations involving vowel epenthesis or elision.[4]

The familiar example of English **–(e)s/–ed** suffixation will serve to illustrate the alternation scenario, in this case involving the epenthesis of a vowel to break up potential sequences of sibilants or alveolar plosives — hence *iz* in **pieces, bushes, churches**, etc. and *id* in **wedded, waited**, etc. Any analysis based on the final-coda assumption requires resyllabification in one guise or another. In a serial-derivational version, it takes the form of two syllabic transformations: one inserts a syllabic position, the nucleus housing the epenthetic vowel, while the other moves the stem-final consonant from a coda (in *piːs•*) into an onset (in *piː•siz•*). In an output-oriented version, these operations are recast as faithfulness violations in the inflected form. One is incurred by the epenthetic position for lacking a lexical source. The other is incurred by the stem-final consonant for appearing in an onset; this renders the inflected form syllabically unfaithful to its base, where the corresponding consonant appears in a coda.

A final-onset approach, in contrast, allows the same facts to be treated without recourse to resyllabification, transformational or simulated. As noted in §2.3.1, word-level suffixes in English, including **–(e)s/–ed**, must be understood as belonging to separate syllabic domains from the stems to which they are attached. Once a stem-final consonant is assumed to occupy the onset of a dull syllable, it will always be separated from a following consonantal suffix by an empty nucleus, as in [[*rɪbØ*]*z*] **ribs** (Kaye 1990).[5] Under most circumstances, the intervening nucleus will remain silent. However, it is clear how the vocalic reflex of **–ed/–(e)s** should be interpreted under this account: as shown in (33), it is the phonetic character the nucleus assumes when it is called on to split the offending consonant clusters.

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[4]There is also a non-segmental way in which an empty nucleus might be expected to betray its presence phonetically, namely by leaving its mark on the offset of the preceding consonant.

[5]Actually, since the suffix in this example is also domain-final, it too might be considered to precede an empty nucleus. This is not crucial to the point at hand.

(32) (a) **wedded** (b) **misses**

```
   O N O N  O N           O N O N  O N
   | | | |  | |           | | | |  | |
 [[x x x x] x x]        [[x x x x] x x]
   | | |    |             | | |    |
   w ɛ d ɨ  d             m ɪ s ɨ  z
```

Syllabically speaking, EPENTHESIS is hardly an appropriate term here at all. No novel syllabic position is inserted; nor is any resyllabified. The inflected form is syllabically faithful to its base. The vowel-zero alternation consists in the phonetic interpretation or non-interpretation of a stable position. As a way of describing a variably interpretable nucleus, the term EMPTY hardly seems appropriate either.

2.5.4 VC typology revisited

We conclude our comparison of the coda and onset analyses of word-final consonants by returning to the typological issue we started with in §2.1. There we noted how the traditional two-way classification of languages into 'CV' and 'CVC' types is contradicted by the observed four-way distinction that emerges from the separate choices grammars evidently make with respect to internal closed syllables and final consonants. The recognition of (domain-internal) branching rhymes and domain-final dull syllables as independent entities allows us to capture the VC typology in a simple parametric fashion. One parameter controls whether or not a grammar allows rhymes to branch: OFF precludes closed syllables. Another controls whether or not a domain-final nucleus is allowed to remain silent: if it is set at OFF, then every word in the language must end in a vowel; if it is on, the language permits final consonants. The intersection of these two independent parameters is shown in (34).

(33)

Final empty nucleus?	Branching rhyme? No	Branching rhyme? Yes
No	**IA** ...V•CV] Zulu	**IIA** ...V(C)•CV] Italian
Yes	**IB** ...V•CV(C)] Luo	**IIB** ...V(C)•CV(C)] English

2.6 Final onsets versus codas: conclusion

We have compared two perspectives on the syllabic status of domain-final consonants, drawing on a range of evidence relating to language typology, word stress, vowel length, and cluster phonotactics. The evidence, it seems to us, comes down firmly in favour of the conclusion that a final consonant is not a coda but rather forms the onset of a syllable containing a nucleus which is allowed to remain silent.

3 Constraint-based syllable typology

3.0 In this part of the paper, we compare two constraint-based approaches to VC typology, a standard one based on the final-coda view (§3.1) and a revised one based on the final-onset view (§3.2). Our conclusion on the final-coda approach is that, while it can be adapted to cover most VC systems, there remains a residue of type-IIA languages that it cannot derive satisfactorily or even at all. The final-onset approach provides a better fit with the relevant facts.

3.1 Final-coda analysis

According to a standard output-oriented implementation of the final-coda view, the choice between open and closed syllables is primarily decided by competition between the markedness constraint NoCoda and faithfulness constraints which either penalise the deletion of lexical positions (Max) or the epenthesis of non-lexical positions (Dep) (Prince & Smolensky 1993, McCarthy & Prince 1995). Together, these evaluate the potential appearance of a VC rhyme in output, irrespective of whether the sequence is located word-internally or word-finally. Closed syllables arise when NoCoda is outranked by one or more faithfulness constraints. When NoCoda is undominated, open syllables are forced by consonant deletion (violating Max) or vowel epenthesis (violating Dep). The familiar two-way typology that this analysis yields is summarised in (35) (C̸ indicates a deleted consonant, V⃞ an epenthesised vowel).

(34)

Language type	Analysis of /CVC/ input	Constraint ranking
'CVC'	CVC•	Max, Dep » NoCoda
'CV'	CVC̸•	NoCoda » Max
	CV•CV⃞•	NoCoda » Dep

In what follows, we will tabulate the interplay between the various constraints relevant to VC typology by taking a schematic CVCCVC form as input. Permuting the syllable parses of the VC sequences contained in this form will illustrate the full set of typological possibilities we are attempting to derive. To keep things brief, we will limit consideration of open-syllable parses to those achieved by consonant deletion. Moreover, we will set aside the independent issue of whether the internal CC cluster can be syllabified as a complex onset. The output associated with each type of VC system is thus as follows:

(35)

Language type	Example	Analysis of /CVCCVC/ input
IA	Zulu	CVC⃥•CVC⃥•
IB	Luo	CVC⃥•CVC•
IIA	Italian	CVC•CVC⃥•
IIB	English	CVC•CVC•

As already noted, the traditional classification which the analysis in (35) implements only accounts for two of these systems, namely types 1A and IIB. To include the other two types, it is necessary to be able to tease apart internal codas and word-final consonants. Since final-coda orthodoxy prevents NoCoda from achieving this, additional constraints have to be called on.

An immediate response might be to appeal to the Align family of constraints, and in particular to the word-syllable alignment constraint referred to in our earlier discussion of extrasyllabicity. The constraint, now spelt out in (37), allows us to target right-edge consonants to the exclusion of internal codas.

(36) Align$^{\text{Word-R/Syll-R}}$: align the right edge of a word with the right edge of a syllable.

Ranking this constraint high derives type-IB languages, those allowing final consonants but not internal codas:

(37)

/CVCCVC/			Align$^{\text{WS}}$	NoCoda	Max
(a)		CVC•CVC⃥•	*!	*	*
(b)		CVC•CVC•		*!*	
(c)		CVC⃥•CVC⃥•	*!		**
(d)	☞	CVC⃥•CVC•		*	*

The competition between the two candidates with properly aligned final consonants, (38)b and (38)d, is decided on the basis of gradient evaluation by NoCoda: because this constraint outranks Max, the form lacking an internal coda wins. In the systems already derived, Align^{WS} is dominated by NoCoda in type IA and by Max in type IIB.

None of the constraints invoked to this point can selectively target internal codas, which means we still have to account for type IIA, the system that permits consonants in this position but not word-finally. It has been suggested to us that this issue might be approached by exploiting the fact that codas in the languages in question tend to be subject to quite severe phonotactic restrictions (Sam Rosenthall, *voce*). The restrictions, which can be such as to limit inter-syllabic clusters to full or partial geminates (Prince 1984, Goldsmith 1989), are expressible in terms of conditions which curtail the contrastive potential of codas (Itô 1986, Itô & Mester 1993, Yip 1991). One such constraint, given in (39), bans a coda from licensing a place node.

(38) CodaCon^{Place}

```
* R
  |
  x
  |
  Pl
```

For coda conditions of this type to be brought to bear on the typological issue at hand, they have to be assumed to function in the manner suggested by Itô (1986) and Itô, Mester & Padgett (1995). This is illustrated in (40).

(39) (a) *–p•*] (b) *–s•p–* (c) *–p•p–*

```
  R                    R     O                 R     O
  |                     \    |                  \    |
  x]                     x   x                   x   x
 *|                     *|   |✓                   \  |✓
  Pl                     Pl  Pl                    Pl
```

The codas in (40)a and (40)b violate the condition in (39). As shown in (40)a, a word-final coda is unable to license a place specification. In the inter-syllabic cluster in (40)b, where each position bears its own place specification, only the place node associated with the onset is licensed. The geminate cluster in (40)c, on the other hand, satisfies the condition: the single place specification, doubly linked, is licensed by the onset.

To see how constraining coda place can help derive a type-IIA system, let us consider two CVCCVC inputs differentiated on the basis of whether or not the internal cluster is a geminate. Restricting ourselves to the same set of output forms as before, consider first the geminate case:

(40)

/C V C C V C/ \/ | Pl Pl	CODACON	MAX	NOCODA
(a) CVC•CVC•	*!		**
(b) CVC̨• CVC•	*!	*	*
(c) ☞ CVC•CVC̨•		*	*
(d) CVC̨•CVC̨•		*!*	

We see here how CODACON produces different evaluations of a coda according to whether it occurs word-internally or finally. With the ranking shown in (41), the optimal candidate is the one in which an internal input coda is preserved but a final coda is deleted — just the result we need for a type-IIA system. Candidates (41)a and (41)b violate CODACON by containing an independently place-specified final coda. The competition between the two candidates both satisfying CODACON is passed to a gradient decision by MAX. Form (41)d is the less marked, by virtue of lacking both codas, but is less faithful than the winning candidate (41)c.

Consider now how the same ranking evaluates candidate analyses of an input containing a nongeminate internal cluster:

(41)

/C V C C V C/ | | | Pl Pl Pl	CODACON	MAX	NOCODA
(a) CVC•CVC•	*!*		**
(b) CVC̨•CVC•	*!	*	*
(c) CVC•CVC̨•	*!	*	*
(d) ☞ CVC̨•CVC̨•		**	

This time, an output candidate containing a faithful parse of the internal cluster will be less optimal than a form in which the potential internal coda is deleted. The appearance of an independent place specification in an internal coda violates CODACON, just as it does in a final coda; hence the marks against the first three candidates for this constraint. And since CODACON is dominant, the winner is the syllabically least marked and least faithful candidate (42)d.

The ranking established in tableaux (41) and (42) generates a type-IIA language in which the only permitted coda is one that forms the first portion of an internal (full or partial) geminate. This is indeed the result we want for languages such as Telegu, and Axininca Campa. As the analysis stands, however, it predicts that all IIA languages will display this correlation, which is clearly not the case. For example, while internal geminates are certainly a feature of Italian, this IIA language also has hetero-organic inter-syllabic clusters such as *sp, sk, lp, lk, rp, rk.*

The analysis embodied in (41) and (42) attempts to derive one aspect of syllable typology from segmental detail. It builds on the more general assumption that the syllabically marked nature of codas is bound up with their diminished ability to support segmental contrasts (see for example Goldsmith 1990: ch3, Prince & Smolensky 1993). However, in failing to distinguish between internal codas and final consonants, the analysis overlooks the point, discussed in §2.4 above, that the segmental parallels between the two contexts are not as close as is sometimes supposed. Moreover, the segmental restrictions in question can be shown to operate quite independently of VC type. Using these restrictions to support the final-coda assumption leads us to expect that a language lacking internal codas would necessarily keep a tighter rein on the contrastive potential of final consonants than a language possessing internal codas. It is not difficult to come up with counterexamples. Some type IIB languages (i.e. with internal codas) actually place heavier segmental restrictions on final consonants than some IB languages (i.e. without internal codas). For example, Modern Greek and Finnish (both IIB) limit final consonants to coronal sonorants or *s*. On the other hand, Luo and Yapese (both IB) allow oral stops in addition to sonorants in this position.

All of this suggests that a successful account of VC typology should not rely on reference to segmental specifics, a point taken on board by the constraint-based implementation of the final-onset account to which we now turn.

3.2 Final-onset analysis

The final-onset analysis of VC typology to be presented here calls on several of the standard constraints already mentioned (NoCoda, Nuc, Max, Dep) and appeals to two other, quite general constraints: one limits the distribution of coda positions; the other regulates the phonetic interpretability of syllabic positions.

According to a full-blooded interpretation of the final-onset view, being followed by an onset within the same domain is criterial of coda status. In other words, a constraint embodying this requirement is universally undominated. The formulation given in (43) recapitulates Kaye's (1990) Coda Licensing principle.

(42) CodaLic: a coda must be licensed by an onset.

With CodaLic undominated, an onset parse of a final consonant will always be more optimal than a coda parse, thereby also guaranteeing satisfaction of NoCoda in this context.

The appearance of a nucleus, albeit a silent one, after the onset housing a word-final consonant is mandated by the constraint Nuc ('syllables must have nuclei'), standardly assumed to be universally undominated (Prince & Smolensky 1993). Since consonant-final forms are marked relative to vowel-final, the emptiness of a final nucleus can be assumed to result from the violation of some markedness constraint. We may view this effect as a local deviation from a general preference for syllabic positions to receive phonetic interpretation, expressed as the constraint in (44).

(43) *Empty: syllabic positions must be phonetically interpreted.

Violation of this constraint will allow output forms to contain uninterpreted positions — for example, onsets in French *h-aspiré*, or nuclei in final-consonant syllabification. In the latter situation, *Empty can be violated in order to satisfy Nuc (it is more optimal to have an uninterpreted nucleus than a stray onset) and CodaLic (it is more optimal to have an uninterpreted nucleus than a final coda).

The effects of the constraints figuring in the final-onset treatment of VC typology are summarised in (45) and (46). (45) lists candidate parses of a word-final consonant.[6] (□ indicates a nucleus without phonetic interpretation; ☑ indicates a nucleus filled by a non-lexical vowel.)

(44)

/VC]/	CodaLic	NoCoda	Nuc	Max	Dep	*Empty
(a) VC•]	*	*				
(b) V•C]			*			
(c) V•C̸]				*		
(d) V•C☑]					*	
(e) V•C□]						*

Word-internally, the relevant constraints — CodaLic aside — function as in the

[6]The constraints Max and Dep are to be interpreted here as evaluating the melodic content of positions, under the standard OT assumption that syllable structure is absent from lexical representations. V.C̸ violates Max, because the deletion of a position entails the deletion of lexical melody. V.C☑ violates Dep, not because of the inserted nuclear position but because of the non-lexical melody it contains.

standard account:

(45)

/VCCV/	CODALIC	NOCODA	MAX	DEP
(a) VC•CV		*		
(b) VC⃥•CV			*	
(c) V•Cv⃞•CV				*

The tableaux of the different VC systems presented below omit two of the constraints in (45) and (46) — NUC (universally undominated and thus identical in its impact on all four systems) and DEP (as before, we exclude vowel-epenthesis candidates from consideration). In order to accommodate forms with final empty positions, the roster of featured output candidates in each tableau now increases to six.

At the heart of the typological variation affecting VC syllabification lies an interplay between faithfulness and the markedness constraints NOCODA and *EMPTY. As we might expect, markedness constraints dominate in IA, the least marked system, while faithfulness dominates in IIB, the most marked system. In the 'intermediate' systems IB and IIA, the two markedness constraints are split by faithfulness.

The doubly unmarked nature of type IA arises from the outranking of faithfulness by both NOCODA (hence no internal codas) and *EMPTY (no final consonants):

(46) Type IA

/CVCCVC/		CODALIC	NOCODA	*EMPTY	MAX
(a)	CVC•CVC•	*!	**!		
(b)	CVC⃥•CVC•	*!	*!		*
(c)	CVC•CVC⃥•		*!		*
(d) ☞	CVC⃥•CVC⃥•				**
(e)	CVC•CV•C□•		*!	*!	
(f)	CVC⃥•CV•C□•			*!	*

The reverse situation yields the doubly marked system IIB:

(47) Type IIB

/CVCCVC/		CodaLic	Max	*Empty	NoCoda
(a)	CVC•CVC•	*!			**
(b)	CVC⃥•CVC•	*!	*!		*
(c)	CVC•CVC⃥•		*!		*
(d)	CVC⃥•CVC⃥•		**!		
(e) ☞	CVC•CV•C□•			*	*
(f)	CVC⃥•CV•C□•		*!	*	

The intermediately marked status of system IB (the Luo type) reflects a situation in which faithfulness is ranked below NoCoda (thereby excluding internal codas) but above *Empty (permitting final consonants):

(48) Type IB

/CVCCVC/		CodaLic	NoCoda	Max	*Empty
(a)	CVC•CVC•	*!	**!		
(b)	CVC⃥•CVC•	*!	*!	*	
(c)	CVC•CVC⃥•		*!	*	
(d)	CVC⃥•CVC⃥•			*!*	
(e)	CVC•CV•C□•		*!		*
(f) ☞	CVC⃥•CV•C□•			*	*

Here, gradient evaluation by Max decides the competition between the two strongest contenders, those satisfying NoCoda: (49)f sees off (49)d by virtue of incurring one less faithfulness violation.

Reversing the ranking in (49) produces the other intermediately marked system, IIA (the Italian type). High ranking of *Empty excludes final consonants, while low ranking of NoCoda permits internal codas:

(49) Type IIA

/CVCCVC/		CODALIC	*EMPTY	MAX	NOCODA
(a)	CVC•CVC•	*!			**
(b)	CVÇ•CVC•	*!		*	*
(c) ☞	CVC•CVÇ•			*	*
(d)	CVÇ•CVÇ•			*!*	
(e)	CVC•CV•C□•		*!		*
(f)	CVÇ•CV•C□•		*!	*	

Here too, the competition between the strongest contenders, this time those satisfying *EMPTY ((50)c and (50)d), is gradiently decided on the basis of which is the more faithful.

The tableaux in (47) through (50) exhaust the set of possible rankings of the four constraints actively involved in the final-onset classification of VC typology. The fact that this figure falls well below the logical total of 12 rankings is due to two factors: one constraint (CODALIC) is universally undominated, while some are not in conflict with one another. The account thus passes the main test of the predictive power of a ranked-constraint analysis: the set of mini-grammars generated by all possible constraint rankings corresponds to the set of attested typological alternatives.

4 Conclusion

The eastern tradition of treating a final consonant as the onset of a dull syllable is vindicated on a number of counts, providing a better fit with the relevant phonological data than does a coda-based approach. The range of data discussed here includes syllable typology, stress, vowel length, and consonant phonotactics. A constraint-based implementation of the final-onset view also provides a straightforward classification of the typological facts.

In short, the east was right all along.

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