An OT Account of Italian Codas

Naomi Nagy, University of Pennsylvania
Donna Jo Napoli, Swarthmore College

1. Introduction

The initial goal of this paper was to explain why the only obstruents found in coda position in Italian were parts of geminates. We found two facts. First, this generalization is not quite true: obstruents in coda position include the first halves of geminates, the first halves of two affricates and one fricative that enjoy a special distribution, many [s/z]'s, and a few other non-geminate obstruents. Second, we found that the presence of these segments in coda position is inextricably linked to several other interacting phenomena, including: phonotactic constraints on what segments may be found in clusters, correlations between stress and vowel length, and consonantal length which varies according to position.

We therefore present an analysis of word-level syllabification and segmental length distributions in Italian, focussing on the segments that occur in coda position. We find that obstruents appear in codas only when the alternatives (such as not parsing the segments or putting them into onsets) are worse. Thus, an ideal theory for handling this syllabification would be a competing constraint-based framework, such as Optimality Theory (OT).

We first present the range of data to be accounted for and make generalizations about the patterns, synthesizing insights from previous accounts. Then we present the constraints invoked to account formally for these generalizations, providing analyses of representative words and justifying the relative rankings of the constraints. Finally, we report on experimental tests which confirm these predictions.

2. Data

2.1. *Vowel length*

All vowels which do not receive primary stress in Italian are short. However, non-final vowels which receive primary stress are long, except when they are followed by certain types of consonant clusters. Those clusters include any consonant cluster which is not found in word-initial position, [s/z] followed by one or two consonants, geminates, and the segments /ʎ/, /ɲ/, /ʦ/, /ʣ/, and /ʃ/. See (1).

(1)

Long stressed vowels		Short stressed vowels	
[pá:tria][1]	'country'	[náfta]	'tar'
[rí:zo]	'rice'	[pésto]	'pesto'
[prá:to]	'Prato'	[trátᵘo]	'trace'
[bwɔ́:no]	'good'	[báɲ:o]	'bath'

2.2. *Single consonants*

Single consonants are found word-initially, medially, and finally in Italian. However, not every consonant can be found in every position in the word with equal frequency. In initial position, all consonants occur freely except /ʎ/, /ɲ/, /ʦ/,

© 1996 by Naomi Nagy & Donna Jo Napoli
Marek Przezdziecki & Lindsay Whaley (eds.), *ESCOL '95*, 212-223, Cornell University

/ʣ/, and /ʃ/, which we call Long Consonants (LC's). /ʎ/ occurs initially only in the word ***gli*** 'the' or 'to him/her/them'. /ɲ/ appears initially in only a handful of words. /ʦ/, /ʣ/, and /ʃ/ appear in fewer than 200 roots each. These five consonants, in addition to having limited distribution, are odd in that they have two allophones in complementary distribution: a long C and a short C. In the long allophone, they resemble geminates. But, unlike ordinary geminates in Italian, LC's do not distinctively contrast with single consonant counterparts. There are minimal pairs of the following types:

(2)

Short segment		Long segment	
[pala]	'shovel'	[palᵘa]	'ball'
*[VʎV]		[paʎ:a]	'straw'
[métriko]	'metrical'	[elétᵘriko]	'electric'
[optsióne]	'option'	*[VʦːV]	

To capture the difference between geminates and LC's, we represent them by the structures shown in (3). The representation of geminates is adopted from Hayes (1989). For LC's, we use the structure proposed for geminates in Selkirk (1990).

(3)

```
single consonant (C)      geminate (Cᵘ)      Long Consonant (C
                                μ
                                |
        C                       C                  C  C
        |                       |                   \/
       [F]                     [F]                 [F]
```

Our appeal to moraic prespecification for the geminate is supported by independent motivation: Inkelas & Cho (1993) argue that geminates are prespecified as moraic in order to account for their inalterability with respect to sonority constraints.

There are no final C's in autochthonous Italian open class words. However, there are a few closed-class items that end in a sonorant, as shown in (4a) and some borrowings that end in a variety of consonants, as shown in (4b) and (5).

(4) Final sonorant

a. Prepositions (few)		b. Borrowings (many)	
in	'in'	*tram*	'tram'
per	'for'	*fon*	'hairdryer'
con	'with'	*bazar*	'bazaar'
		tunnel	'tunnel'

(5)

a. Final [s/z] (several)		b. Final obstruent (few)	
gas	'gas'	*zigzag*	'zigzag'
autobus	'bus'	*stop*	'stop'
		night	'nightclub'

We see that word-final sonorants, though infrequent, are less exceptional than word-final obstruents. Extending this to all syllables, we propose:

(6) Harmonic Coda Principle (HCP): The more sonorous a consonant is, the less marked it will be in coda position.

2.3. *Consonant clusters*

We leave clusters containing [s/z] +C(C) for the end of this section. Word initially, the only consonant clusters that occur consist of obstruent (except an affricate) + approximant, as shown in (7).

(7) Word-initial clusters

stop + liquid	*treno*	'train'
fricative + liquid	*frutta*	'fruit'
stop + glide	*piuma*	'feather'
fricative + glide	*fiume*	'river'

Word-medially, we find clusters of three types. The first consists of a sonorant followed by any C that can be word-initial (8a). While the obstruent LC's can occur in clusters with short duration, the sonorant LC's do not (8b). The second type consists of obstruent + approximant (8c). The third consists of geminates (8d).

(8) Word-medial clusters

a.	sonorant + stop	*alto*	'high'
	sonorant + affricate	*marcio*	'rotten'
	sonorant + fricative	*anfiteatro*	'amphitheater'
	sonorant + nasal	*calmo*	'calm'
	sonorant + liquid	*perla*	'pearl'
	geminate sonorant	*palla*	'ball'
b.	sonorant + [ʃ]	*conscio*	'conscious'
	sonorant + [ts]	*calza*	'stocking'
	sonorant + [dz]	*Marzocco*	a Florentine insignia
c.	stop + liquid	*capro*	'goat'
	fricative + liquid	*bifronte*	'bifrontal'
d.	geminate stop	*gatto*	'cat'
	geminate affricate	*riccio*	'curl'
	geminate fricative	*baffi*	'mustache'

The following are exceptions to this generalization, all of Greek or Latinate origin.

(9) Greek and Latinate exceptions

stop + nasal	*atmosfera*	'atmosphere'
	segmento	'segment'
stop + coronal stop	*abduzione*	'abduction'
stop + coronal affricate	*opzione*	'option'
stop + coronal fricative	*capsico*	'capsicum' (botanical term)
fricative + coronal stop	*nafta*	'tar, diesel oil'

2.4. *[s/z]-clusters*

We turn next to clusters consisting of [s/z] + C(C). [s/z] can precede almost any C(C) that can itself occur word-initially, as shown in (10).

(10)

	a. Initial [s/z] + C(C)		b. Medial [s/z] + C(C)	
[s/z] + stop	*spirito*	'spirit'	*pasta*	'pasta'
[s/z] + affricate	*sgiusto*	'injust'	*disgelo*	'thaw'
[s/z] + fricative	*svelto*	'slender'	*atmosfera*	'atmosphere'
[s/z] + nasal	*smalto*	'enamel'	*bisnonna*	'great-grandmother'
[s/z] + liquid	*slavo*	'Slavonian'	*dislocazione*	'dislocation'
[s/z] + CC	*strega*	'witch'	*disfrondare*	'to lose leaves'

Such initial clusters may violate the general rule of rising sonority in onset clusters. Data such as those shown in (10a) are the basis for the well-accepted proposal that a word-initial [s/z] + C is extrasyllabic (Chierchia 1986, Itô 1986, Davis 1990, inter alia). We propose that when [s/z] is initial to a prosodic word (PrWd) and followed by a C, it is incorporated directly into the following PrWd, shown in (11a).

Medial [s/z] followed by an obstruent cannot be syllabified into the onset of the following syllable (it would violate the sonority hierarchy). The frequent occurrence of words with this sequence suggests that such an [s/z] is syllabified as the coda of the preceding syllable, as in (11b). This is supported by the fact that if a primary stressed vowel precedes such an [s/z], it is short, as in [pasta] 'pasta'.

(11) a. Structure of initial sC cluster b. Structure of medial sC cluster

```
        PrWd                                   PrWd
   /   /    \                                 /    \
  |   σ      σ                               σ      σ
  |   /|     |                              /|      |
  |   μ μ    μ                              μ μ     μ
  |   /|/    /\                             /| |    /|
  s  t i:   l e    'style'                 p a s   t a    'pasta'
```

The left structure violates the Layering Constraint (Itô & Mester 1992), and is, therefore, problematic, as it should be, since words that begin with [s/z] followed by C exhibit unusual phono-morphological behavior throughout Indo-European.

However, the presence of [s/z] in codas contradicts the statement that only sonorants (and geminate obstruents) may occur in Italian codas. Why should this be? A first hypothesis is that [s/z] is sonorant in Italian (so that sonorant codas and [s/z] codas should be treated equally, as in Basbøll 1974, Zec 1988, and Sherer 1994, inter alia). However, if [s/z] were [+sonorant] we would have no account for why it does not behave like other sonorants with respect to truncation (*andiamo* -> *andiam*, but *baso* is never **bas*.) and to many phonological rules of Italian. For example, nasals assimilate to sonorants across a morpheme boundary (Nespor 1993:77, inter alia), but not to [s].

Nevertheless, [s/z], the most frequently found obstruent in coda position, is the most sonorous of the obstruents (Selkirk 1984). Thus, while we take [s/z] codas to be marked (as in Vogel 1977 and Itô 1986: 39, fn 8), they are less marked than other obstruent codas, following HCP.

2.5. *Geminates*

Geminates occur only intervocalically, with the exception that obstruent geminates also occur immediately after a V and immediately before an approximant. This follows from our representation of geminates. We expect them to occur only where they can be doubly-syllabified, so that the prespecified mora appears in coda position, while the segmental features link to the following mora as well. In Italian, then, all geminates will be syllabified, as shown in (12).

(12) Syllabification of geminates

```
σ       σ
/\      |
μ μ     μ
| \    //|
V   G (C)V
```

With this analysis, the first timing slot of a geminate is the coda of the preceding syllable. Prespecification, then, accounts for why obstruents can occur freely in coda position only when they are part of a geminate. This representation predicts that geminates will not appear following another C or preceding any C other than an approximant, or, if they do, that they will be shortened in those positions by the mechanism of Stray Erasure.

2.6. *Long consonants*

The LC's are /ʎ/, /ɲ/, /ts/, /dz/, and /ʃ/. As we have noted, these consonants are peculiar in several ways, summarized in (13).

(13) Peculiarities of LC's
LC's are long intervocalically, but short elsewhere.
LC's occur very rarely in non-intervocalic position.
Those LC's which are most rare in word-initial position are not found in medial position following a C *(even a sonorant C)*.
No LC's are found medially followed by any other distinct C.
LC's are not found in medial CCC clusters.

These facts are accounted for by our representation of LC's as being two timing slots, linked to one set of features. If an LC occurs in any position other than intervocalically, one half of it will fail to be linked to a mora, hence it will fail to be syllabified and Stray Erasure will apply. The phonetic result is a short segment.

(14) Long LC / Initial short LC / Medial short LC

```
Long LC           Initial short LC        Medial short LC
 σ     σ               σ     σ          σ          σ      σ
 /\    |              /|     |          /|         /|     |
 μμ    μ              μ μ    μ          μμ         μ μ    μ
 /||   /|             /|/    /\         /||        /|\|   /|
p a ʎ  ʎ a       <ɲ>  ɲ o:   m e      k ap <tˢ>   ʦ jo:   zo
    \/
    [F]  'straw'      'gnome'              'fraudulent'
```

2.7. *Affricates*

Affricates do not occur in medial clusters (other than as geminates) *except after a sonorant* in a CC cluster. In other words, affricates are allowed in codas only when they are the first part of a geminate.

3. Prosodic structure

3.1. *Morification*

We adapt Zec's (1988) algorithm for morification of segments, reproduced in (15).

(15) Universal Morification (UM) (Zec 1988:99)
Given a sequence S of unlinked segments s_1, s_2, ...s_i,...s_n, link S to μ iff:
a. s_i is an extension of s_{i-1}
b. s_n is a member of the set of moraic segments {vowels, sonorants}
c. s_n is an extension of the immediately following segment, if any.

To interpret this, we need the following:

(16) Segment A is an extension of Segment B iff all feature specifications in B are also found in A (Zec 1988:99).

The relevant feature specifications for morification are [sonorant], [approximant], [consonantal]. There are four groupings of segments according to these features: obstruents, nasals, liquids, and vowels, as seen in (17).

(17) Sonority Table

O <	N <	L <	V	
			-	consonantal
		+	+	approximant
	+	+	+	sonorant

In order to account for the onset restriction shown above -- that CC onsets in Italian are restricted to being an obstruent followed by an approximant -- we need to add a condition on the segments in the sequence that can make up a mora:

(18) Non-adjacency condition: Two consonants within one mora must be from non-adjacent columns in the Sonority Table.

3.2. *Syllabification*

Again we follow Zec (1988:105). Moras are grouped together into syllables, with at most two moras per syllable. Within a syllable, the second mora cannot be more sonorous than the first (where the sonority of moras is judged by comparing the sonority of the last segment of each mora). With the addition of the Non-adjacency condition (18), these algorithms work neatly for most cases, as shown in (19):

(19)

```
a. V + C + V                         b. V + obstruent + approximant + V
     σ    σ                               σ     σ
    /|    |                              /|     |
   μ μ    μ                              μμ     μ
  //|/   /|                             /|/    //|
  t r e:  n o     'train'               k a:   p r a        'goat'

c. V + sonorant + C + V              d. V + geminate + V
     σ    σ                               σ     σ
    /|    |                              /|     |
   μ μ    μ                             μ μ     μ
   /||   /|                             /|\    /|
  s a l  t o      'I jump'              r i  tʃ: o          'sea urchin'
```

UM, however, does not account for the fact that we find words with two non-geminate obstruents intervocalically, such as *pasta*, analyzed above in (11b). In *pasta*, [s] is left unmorified by UM. Nevertheless, we know that the [s] of *pasta* is in the coda of the preceding syllable, since the vowel that precedes it is stressed and short: [pásta]. So this consonant is assigned a mora somehow.

Zec's (1988:51) solution to this problem is to suggest that [s] is moraic in Italian. However, this will not account for all instances in which [s/z] occurs in coda position. There are words in Italian in which medial [s/z] is followed by a sonorant consonant, as in *cosmo* 'cosmos', *asma* 'asthma', *comunismo* 'communism'. Since the [s/z] is not an extension of the following sonorant, the [s/z] cannot be morified by UM even if [s/z] is a moraic segment of Italian.

A further problem is that there are codas in Italian that are neither sonorant nor [s/z] and at the same time are not the first half of a geminate. Must we add the obstruent LC's [ts], [dz], and [ʃ] to the list of moraic segments in Italian? Worse, there are scattered words in which single nonsibilant obstruents appear in coda position, as in (9). Must we add all these obstruents to the list of moraic segments of Italian? The contrast between moraic and non-moraic segments would be entirely lost. We, therefore, do not follow Zec (1988). Rather, we maintain that the only moraic segments in Italian are vowels and sonorants. We must account for obstruent codas with something other than UM. We propose an auxiliary process which is responsible for the morification of [s] in *pasta*:

(20) Free Morification: All unmorified segments get assigned a mora.

The HCP predicts that sibilants will appear in codas more than other obstruents.

4. Formal analysis

Constraints are of three types: FAITHFULNESS, which militate against differences between input and output; ALIGNMENT, which favor candidates with coinciding edges of various constituents; and PROSODIC STRUCTURE, which favor candidates whose prosodic constituents are of a particular shape.

The PARSE family of constraints is violated when material in the input does not appear in the output. Elements which are not associated to a constituent at the next higher level do not surface. They are indicated by angle brackets.

(21) PARSE SEGMENT (PARSE-S): Every segment must be associated to a mora (McCarthy & Prince 1993:37).

It is due to this constraint that obstruents which precede another obstruent are put in codas rather than deleted.

(22) PARSE MORA (PARSE-μ): Every mora must be associated to a syllable.

To comply with this constraint, geminates surface as long whenever possible.

The FILL family is violated when material in the output does not appear in the input, indicated by outline characters (McCarthy & Prince 1993:25).

(23) FILL SEGMENT (FILL-S): Only segments present in the input are parsed by a mora. μ | *T

It is due to this constraint that epenthesis is not used to break up clusters.

The ALIGN family of constraints requires corresponding edges of various constituents, both morphological and prosodic.

(24) ALIGN SEGMENT TO SYLLABLE (ALIGNSσ): One segment (even if it is associated with two timing slots) should not be associated to two syllables.

This is an implementation of the Crisp Edge constraint scheme (Itô & Mester 1994:31) which prohibits ambisyllabic segments. Geminates offer transparent violations of ALIGNSσ.[2] See (12).

(25) /s/TO PRWD (/s/-PRWD): when [s/z] appears at the beginning of a prosodic word it must be parsed.

This stipulative constraint highlights the odd behavior of [s/z] in Indo-European languages (Watkins 1985). It allows for a violation of Layering (Itô & Mester 1994), so that word-initial [s/z] can be parsed directly by PrWd (as in 11a).

We turn next to a set of high-ranking prosodic structure constraints, for which there are no transparent violations.

(26) HEAVY SYLLABLE (HEAVY): Syllables with primary stress are bimoraic. (CVC or CV:).

(27) MORA: Each mora must conform to UM.

This constraint prohibits tautomoraic clusters with falling sonority.

(28) SYLLABLE (SYLL): A syllable is maximally bimoraic. If a syllable contains two moras, the one on the right may not be more sonorous than the one on the left (adapted from Zec 1988:105-7)

(29) HARMONIC NUCLEUS (HNUC): The nucleus of a syllable is a vowel.

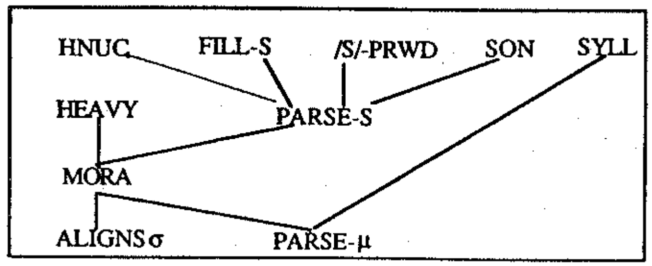
This constraint prohibits moras from forming syllables without vowels.

(30) SONORITY DISTANCE (SON): Two consonants in one mora may not come from adjacent columns of the Sonority Table.

This constraint prohibits nasals from appearing in tautomoraic clusters, as well as prohibiting 2 obstruents or 2 approximants in one onset.

These constraints are ordered as shown in (31). Downward lines indicate crucial orderings. Relevant crucial orderings are indicated above each tableau.

(31)



We find long vowels only in nonfinal, open, primary stressed syllables. The result of HEAVY being highly ranked is that the optimal candidate always has a heavy stressed syllable, even when such a candidate violates MORA, as illustrated in (31).

(32) V + single C HEAVY >> MORA

/pála/ 'shovel'	HEAVY	MORA
σ σ | | μ μ /| /| p a l a	*!	
F σ σ /| | μμ μ /|/ /| p a: l a		*
σ σ /| | μ μ μ / | | / | p a l a		*

We consider a candidate with the morification provided by UM, which violates HEAVY, as well two other candidates that do not violate HEAVY: a candidate with a mora added to the first /a/, and a candidate where the /l/ appears in the coda. The surfacing form in Italian is the second candidate, because HEAVY >> MORA.

We turn next to words with an intervocalic geminate or sonorant LC.

(33) V + geminate or sonorant LC MORA >> ALIGNSσ

/pál$^{\mu}$a/ 'ball'	MORA	ALIGNSσ
F σ σ /| | μ μ μ /| | /| p a l a		
σ σ /| /| μμ μ μ //| \/| p a: l a	*!	

Here, the optimal candidate will not have a long vowel because the stressed syllable can be made heavy with the mora of the geminate or sonorant.

Next we consider the "exceptional" words with obstruent + non-approximant clusters, as in (34).

(34) V + obstruent + non-approximant C HEAVY >> MORA

/básta/ 'enough'	HEAVY	PARSE-S	SON	MORA
ba.<s>ta	*!	*		
ba:.<s>ta		*!		
ba.sta	*!		*	*
ba:.sta			*!	*
F bas.ta				*

Here, the optimal candidate will have a short vowel. The first obstruent (here, /s/) is linked to a mora and appears in the stressed syllable's coda, making it heavy.

On the other hand, when a word-medial [s/z] precedes an approximant, it will be syllabified in onset position because the cluster violates neither MORA nor SON. In that case, the optimal candidate has a long vowel.

5. Testing our predictions

To support our model's predictions, we present the results of a simple elicitation task that we conducted with 7 native speakers of Italian. Each speaker was given a list of 38 words and asked to read them, then pronounce each word with *ghe* inserted after each syllable.[3] Each speaker did this twice, except for 1 speaker who completed the task only once, so we have 13 trials.

We drew two kinds of information from the data obtained. The first pattern considered was the distribution of long vowels. Our impressionistic analysis fully confirms the length pattern that our formal analysis predicts.

The second pattern considered was the placement of the *ghe* word-internally, which allowed us to check the syllabification consciously chosen by each speaker and determine whether it agreed with our predictions. Out of 89 sites for syllabification in the 38 words, there were 27 sites which showed some degree of variation, with a total of 72 aberrant tokens. The aberrations make up only 6% of the data: 72/(13 x 89)=.06, and are distributed as shown in (35). All systematic aberrations are readily accounted for as follows.

(35)

Site of aberration	N	Possible sites	% aberrant forms of this type
Geminates	24	247	10%
[s/z]	22	65	34%
unusual clusters	9	52	17%
morpheme boundaries	6	39	15%
TOTAL	72	1,157	6%

The first type of site where syllabification didn't always match our predictions was geminates. Some speakers frequently syllabified the entire geminate in onset position. However, the fact that they did not lengthen the preceding stressed vowel in the word-utterance suggests that at the subconscious level the geminates are ambisyllabic, as they contribute weight to the preceding stressed syllable.

A close examination of geminates provides further support for the HCP. Only 4% of sonorant geminates, vs. 13% of the obstruent geminates, were not ambisyllabified. The higher percentage of obstruent geminates being placed entirely in onset position shows the gradient effect of the HCP: a stronger preference to keep obstruents out of the coda, even when they are part of a geminate.

The second type of aberration involved [s]. Some speakers kept medial [s/z]C clusters together in onsets, rather than recognizing a syllable break after the [s]. In all such instances, the evidence from vowel length indicates that the actual syllabification during word utterance was [s.C(C)], as predicted by our analysis. (That is, everyone said [pas.ta] not [pa:.sta].) We attribute this behavior to interference of a rule consciously learned in school for proper hyphenation in writing, which states that "s" goes into the syllable with the following consonant.

The third type of systematic aberration involved the words *atleta* and *ablativo*. According to our analysis, the clusters in both should be syllabified as onsets, as they were in most cases. However, [tl] does not exist as a word-initial onset in Italian, and [bl] exists in only a few words. Thus, speakers' knowledge about existing clusters interferes, and they, accordingly, break up these clusters.

6. Conclusions

We see two kinds of advantages to our model over a rule-based derivational model. The first advantage to this particular model of Italian syllabification is that connections can be made between various parts of the grammar. The OT analysis connects geminate syllabification, consonant cluster syllabification, vowel lengthening processes, and the phonotactic constraints regarding which segments can appear in onset and coda position. All of these facts fall out from the same small set of ranked constraints. In a derivational model this range of data is unconnected and separate stipulations are needed: such constraints are listed individually and conspiracies are not made explicit.

The second is a theoretically superior account of the syllabification of individual words. With a derivational approach we might argue that some obstruents, when forced into coda position, are morified (as in Hayes 1986). But in order to recognize that an obstruent is forced into coda position, we must already have syllabified it. Thus a derivational approach introduces a circularity that is absent from a templatic approach.

Furthermore, OT can easily account for forms that have to be categorized as exceptions in a derivational analysis. While a derivational account could have counterparts for all the constraints we've outlined in Section 4, it lacks a mechanism for handling interactions between violable constraints. There is no way to capture the fact that, e.g., obstruent coda C's occur only when putting them into the following onset would be even worse. In our model, a word like [naf.ta] surfaces because it is the optimal candidate: it is not an exception.

Finally, alignment constraints are perspicaciously handled in OT, but they have no natural place in derivational approaches. OT is well-suited to account for syllabification and, in fact, any phenomena for which syllable structure is crucial.

Endnotes

*We would like to thank Gene Buckley, Stuart Davis, Laura Downing, Michael Hammond, Mark Liberman, Michael Hammond, Marina Nespor, Lori Repetti, Tim Sherer, Draga Zec, and especially Hadass Sheffer, for comments on earlier drafts. We also thank Don Ringe, Bruce Hayes, and Natsuko Tsujimura for information on consonant clusters in various languages. Finally, we thank our informants for their patience and generosity of spirit.

[1] For all transcriptions in this paper we follow Zingarelli (1970) or Nespor (1993). We offer two caveats: There is variation in quality of mid-vowels among speakers. Second, the non-syllabic portions of diphthongs are represented as glides rather than as vowels without prejudice as to their analysis in the syllable.

[2] "Transparent violation" refers to an optimal candidate violating a given constraint.

[3] This is the word list we used (including 2 made-up words), with predicted syllabification indicated:

1) pre.te	2) per.la	3) bas.ta	4) I.ta.li.a
5) i.gno.bi.le	6) noc.cio.la	7) il.le.ga.le	8) con.net.te.re
9) dis.col.pa	10) op.zi.o.ne	11) cot.to	12) i.per.me.tro
13) in.na.tu.ra.le	14) a.tle.ta	15) gat.to	16) pig.men.to
17) i.per.ri.mor.so	18) at.mos.fe.ra	19) scrit.tri.ce	20) in.su.pe.ra.bi.le
21) ci.sal.pi.no	22) con.trar.re	23) cis.sel.vo.so	24) ab.nor.me
25) noc.cio.lo	26) ca.mi.on	27) man.dor.la	28) di.so.nes.to
29) mat.to	30) fram.men.to	31) ri.cot.ta	32) in.ter.rom.pe.re
33) ap.ne.a	34) in.ter.me.di.o	35) scrit.to.re	36) fat.to
37) a.bla.ti.vo	38) dis.sod.dis.fa.zi.o.ne		

References

Basbøll, H. (1985). Stød in Modern Danish, *Folia Linguistica* 19:1-50.
Chierchia, G. (1986) Length, Syllabification and the Phonological Cycle in Italian. *Journal of Linguistics* 8:5-34.
Davis, S. (1990) The onset as a constituent of the syllable: evidence from Italian. *Papers from the 26th Regional meeting of the CLS. Volume 2: The Parasession on the syllable in phonetics and phonology* 71-79.
Hayes, B.(1986) Inalterability in CV Phonology. *Language* 62.2:321-351.
—— (1989) Compensatory lengthening in moraic phonology, *LI* 20: 253-306.
Inkelas, S. and Y. Cho. (1993) Inalterability as prespecification. *Language* 69:529-74.
Itô, J. (1986) *Syllable theory in prosodic phonology*. Doctoral dissertation. University of Massachusetts at Amherst. reproduced by GLSA.
—— & A. Mester. (1992) Weak layering and word binarity, Linguistics Research Center, Cowell College, UCSC, Santa Cruz, CA.
McCarthy, J. & A. Prince. (1993) Generalized Alignment. In G. Booij & J. van Marle (eds.), *Yearbook of Morphology 1993*. Dordrecht: Kluwer. 79-153.
Nespor, M. 1993. *Fonologia*. Bologna: il Mulino.
Selkirk, E. (1984) On the major class features and the syllable theory, M. Aronoff and R. Oehrle (eds.) *Language sound structure*. Cambridge, MA: MIT Press, pp. 107-136.
—— (1990). A Two root theory of length. *UMOP* 14. (presented at NELS 1988).
Sheffer, H. (forthcoming) *Phonology of Modern Hebrew: an Optimality Theoretic Account*. doctoral dissertation. University of Pennsylvania.
Sherer, T. (1994). *Prosodic phonotactics*. doctoral dissertation printed and distributed by GSLA at Univ. of Massachusetts at Amherst.
—— & S. Scalise. (1982) Secondary stress in Italian. *Lingua* 58:213-242.
Watkins, C. (ed.) 1985. *The American Heritage Dictionary of Indo-European Roots*. Boston: Houghton Mifflin.
Zec, D. (1988) *Sonority constraints on prosodic structure*. Doctoral dissertation. Stanford University.