CHAPTER 5

MEDIAL SYLLABIFICATION OF s+STOP ONSETS

5.1 Introduction

In the previous chapters I have argued that different degrees of markedness exist among the various obstruent clusters. I have shown that, on the various dimensions relevant to obstruent clusters, s+STOP onsets turn out to be the least marked of all the clusters of this type. In particular, they are unmarked along the dimension of the feature [continuant] because they are FS clusters. On the place dimension, they are the least marked of all because the fricative in pre-obstruent position is a coronal.

The main purpose of this final chapter is to derive the unmarkedness of s+STOP clusters from the constraint system proposed and to defend the view that s+STOP onsets are indeed regular tautosyllabic onset clusters rather than heterosyllabic or monosegmental, as argued by a number of authors. I will show how the strongest pieces of evidence that have been used in support of the view that s+STOP onsets are not regular tautosyllabic onsets can find independent explanations. In particular, I argue that the heterosyllabicity of medial s+STOP in Italian does not provide evidence for the ill-formedness of these clusters in the language, as argued in previous approaches. I show that such a pattern of syllabification is just a consequence of minimal violations of basic OT syllable structure constraints. I also discuss the case of Sanskit reduplication and argue

that this process as well cannot be considered evidence for the ill-formedness of s+STOP clusters in this language.

5.2 s+STOP Onsets and the Sonority Sequencing Principle

Onset clusters consisting of s+STOP constitute a major outstanding problem in previous phonological theories. Such clusters constitute violations of the Sonority Sequencing Principle (see discussion in Chapter 1). Depending on whether fricatives and stops are assigned the same or different sonority values on the sonority scale, these clusters represent either "sonority plateaus" or "sonority reversals", respectively. But despite the fact that they violate the SSP under any version of the sonority scale, these types of clusters are quite common among a significant number of languages that allow complex syllable margins. As a matter of fact, a common phonotactic pattern in the onset consists of core clusters, i.e. obstruent+sonorant, and s+STOP clusters. In other words, in many systems the only obstruent clusters allowed are s+STOP clusters.

In order to reconcile their cross-linguistic occurrence and the SSP, many researchers have proposed that s+STOP clusters enjoy a special status in phonological theory and are therefore immune to the principle. Among the many proposals, for example, Steriade (1982, 1988) and Clements (1990) argue that these clusters are created by post-cyclic syllabification rules, which are not constrained by relative sonority. They argue that their special status lies in the fact that, at the level where the SSP is relevant, i.e. core syllabification, these clusters

do not form tautosyllabic sequences. Their heterosyllabicity at that point makes them immune to the SSP because the principle holds over tautosyllabic sequences only. For Harris (1994), clusters of this type are never tautosyllabic. He argues that the /s/ in an s+STOP cluster is not part of the onset, but it rather belongs to the coda of a preceding syllable or of a nucleusless syllable, in the case of initial onsets. Other researchers, such as Fudge (1969) and Selkirk (1982), propose that their special behavior lies in the fact that they are single onsets, thus able to escape the SSP because the SSP holds over tautosyllabic clusters and not mono-segments. From a representational point of view, Broselow (1991) proposes that the fricative in an s+STOP onset is licensed by virtue of its link to the following stop (which she calls "parasitic licensing"). In the same vein, Steriade (1994) proposes that their mono-segmental status is structurally represented by the fact that, in an s+STOP sequence, the fricative does not occupy an independent position but rather a segment internal slot. She defines such a position as an Approach-to-Closure position. Finally, Fujimura (1995, 1996, 1997), within his Converter/Distributor Model of phonetic implementation, analyzes s+STOP clusters as integral units specified with the feature {spirantized}. The feature {spirantized} is implemented by two concurrent elemental gestures, one for the frication generation and the other a stop closure.

The main problem with such approaches is that they stipulate special syllabification rules or representations for s+STOP clusters in order to justify their immunity to the SSP. However, these clusters are quite common clusters, which

makes an approach that treats them as “exceptions” not satisfactory. The typology that I propose shows that these types of clusters are indeed the unmarked obstruent clusters. Treating them as marked, i.e. exceptions, rather than as unmarked phonotactics reflects a misunderstanding of the facts themselves. Moreover, strong independent evidence to support their "special" status with respect to the SSP is not always easy to find. And when such evidence can be found, it can, indeed, be easily attributed to independent principles of grammar, as I will show later in the chapter. Finally, I will argue that even one of the strongest pieces of evidence found in Italian for the heterosyllabicity of initial s+STOP clusters follows straightforwardly from independent facts. Specifically, I show how the syllabification of medial s+STOP clusters and the allomorphic alternation of the definite article in Italian is just a natural consequence of the ranking of basic markedness constraints in Optimality Theory (Prince and Smolensky 1993).

5.3 s+STOP Onsets: the Unmarked Phonotactics

Based on the results obtained from the typological study introduced in the previous chapters, we see that s+STOP clusters are the least marked obstruent clusters, and therefore not exceptional as suggested in previous literature. I argue that these types of clusters form regular onset tautosyllabic clusters, just like clusters such as /tr/ do. Within their own domain, onset s+STOP clusters are the unmarked cluster type by virtue of being unmarked along both the manner and the place dimensions.

On the manner dimension, s+STOP clusters are unmarked because they consist of a fricative followed by a stop. I have argued, in Chapter 2, that sequences of this type are unmarked along the continuancy dimension. Recall that their unmarkedness results from the fact that FS clusters do not violate any of the constraints proposed in Chapter 2. I repeat the tableau showing their unmarkedness below:

(1)

	OCP[+cont]	*SO	OCP[-cont]
a. FS			
b. FF	*		
c. SF		*	
d. SS		*	*

The tableau shows that, under this set of constraints, FS is the most harmonic of all the clusters because it receives no marks on any of the constraints. For this reason, it is claimed to be the unmarked cluster among the obstruent clusters.

On the place dimension, s+STOP clusters are the most harmonic clusters because the least marked place surfaces in pre-obstruent position. I have argued, in Chapter 4, that in this position place distinctions are harder to maintain due to the fact that this is not a release position and perceptual cues are impoverished. Due to absence of strong place cues, the fricative in pre-obstruent position is most likely to undergo place neutralization. From this view, it follows that the least marked onset obstruent systems are systems in which only coronal, i.e. the least

marked place of articulation, is licensed in a position of weak perceptibility. The ranking that formalizes this intuition corresponds to a ranking of place neutralization in a position where transitional cues are absent. The ranking is repeated below:

(2) Ranking for place neutralization in pre-obstruent position

$\text{Ident}_{\text{Rel}}$Place >> *Lab >> Ident-Obs-Place >> *Cor

The effect of the ranking in (2) is shown in tableau in (3). A hypothetical input of the form /fp/ which contains a labial in both pre-obstruent and pre-vocalic positions surfaces as /sp/ with a coronal in pre-consonantal position instead.

(3)

/fpV/	$\text{Ident}_{\text{Rel}}$Place	*Lab	Ident-Obs-Place	*Cor
a. ☞ spV		*	*	*
b. fpV		**!		
c. ftV	*!	*	*	*
d. st	*!		**	**

Candidates (c) and (d) both incur a violation of the higher ranked positional faithfulness constraint because the prevocalic /p/ is neutralized to /t/, thus violating the constraint that preserves place contrast in stronger positions. Candidate (b), instead, satisfies Ident-Obs-Place, but violates *Lab twice, once because of the labial fricative and the other because of the labial stop. Notice, however, that the fatal violation is actually the one incurred because of the labial fricative and not the one incurred because of the labial stop, which is incurred by

the winning candidate as well. Parsing a labial in prevocalic position is better than neutralizing it to coronal in order to avoid violation of the higher ranked $Ident_{Rel}$Place constraint. On the contrary, parsing a labial in pre-obstruent position is worst than neutralizing it because place in that position is only preserved by the general constraint Ident-Obs-Place, which is however dominated by the *Lab constraint. Candidate (a), in which place is preserved in the segment occurring adjacent to a vowel, but neutralized in pre-consonantal position, is the most harmonic candidate because it only incurs violations of lower ranked constraints.

Under the proposal that treats s+STOP clusters as unmarked clusters within their own domain, the fact that they are quite common cross-linguistically is the logical consequence of the analysis and does not need to be stipulated. A pattern in which core clusters and s+STOP clusters occur in the onset is, therefore, a relatively unmarked system. Although s+STOP clusters are relatively more marked than core clusters, they are, however, the least marked among the obstruent clusters.

In this section I have discussed the fact that s+STOP onsets clusters represent the least marked among the obstruent clusters. In the next section, I show how some of the evidence that has led previous researchers to argue for the special status of s+STOP clusters can actually be attributed to other principles of grammar. Firstly, I will discuss syllabification of medial s+STOP sequences in Italian. I will show that, contrary to previous analyses, heterosyllabicity of medial clusters does not constitute evidence for the ill-formedness of s+STOP clusters in

the language. On the contrary, it is the result of the interaction of the basic markedness constraints on syllable structure. Secondly, I show how the Sanskrit reduplication patterns discussed in Steriade (1988) are actually a pure case of The Emergence of The Unmarked (McCarthy and Prince 1995) rather than evidence for the ill-formedness of s+STOP clusters.

5.4 Case Study VI: Standard Italian

Standard Italian has been argued to provide one of the strongest pieces of evidence for the special status of s+STOP clusters. In particular, Italian provides clear evidence that in medial position s+STOP clusters are never tautosyllabic. Moreover, s+STOP and core clusters behave differently in certain morphological contexts. These facts have led many researchers (Chierchia (1983); Kaye, Lowenstamm and Vergnaud (1990); Burzio (1989); Davis (1990); Harris (1994)) to argue that s+STOP clusters are not formed by the regular phonotactic rules, but rather by later adjunction rules. In other words, for these authors s+STOP clusters are ill-formed at the level of core syllabification and become well-formed at a later stage of the derivation. I propose, instead, that these facts have an independent explanation and cannot be considered evidence for the ill-formedness of s+STOP clusters.

5.4.1 Cluster Phonotactics

In this section I will provide a description of Italian cluster phonotactics. A correct characterization of what can be considered representative of the native phonotactics is necessary in order to properly characterize the grammar as well.

Consonant clusters in Italian can be grouped into the following three major categories:

(4) a. Core clusters (pr, pl, br, bl, tr, dr, kr, gr, gl, fr, fl)[1]

b. Obstruent clusters (FS: sp, st, sk)[2]

c. s+sonorant/fricative clusters (sm, sn, sl, sr, sf)

Core clusters include all the clusters that contain any obstruent (except /s/) followed by a liquid. I consider these, together with the obstruent cluster of the form s+STOP, the core phonotactics of the language. Both types show the same distributional properties. In initial position, they are the only ones that are also found in monomorphemic words. Both types occur in initial and medial position in monorphemic words. I provide examples below:

[1] The cluster [pn] is only found in a few words of Greek origin and is therefore excluded as an example of native phonotactics.

[2] Note that in Italian s/z are allophones of the same phoneme and that s+STOP clusters must agree in voicing. Clusters such as [zb], [zd] and [zg] also occur. [ps] and [ks] are also found in a few words of Greek origin and again are not considered part of the native phonotactics

(5) a. Core Clusters:

	Initial		Medial	
[pr]	proposito	"purpose"	capra	"goat"
[pl]	plastica	"plastic"	completo	"complete"
[tr]	treno	"train"	metro	"meter"
[dr]	drappo	"cloth"	cedro	"citron"
[kr]	croce	"cross"	micragna	"scarsity"
[fr]	fratello	"brother"	affresco	"fresco"[3]
[fl]	flagello	"whip"	afflizione	"torment"

b. s+STOP clusters

[sp]	specchio	"mirror"	ospite	"guest"
[st]	stato	"state"	pasta	"pasta"
[sk]	scudo	"shield"	losco	"shady"

The clusters of the type in (4c), on the other hand, all consist of /s/ followed by either a sonorant or a fricative. The vast majority of s+C clusters is indeed formed by affixation of the prefix /s-/. This is an extremely productive prefix that can attach to verbs, nouns and adjectives and has different functions depending on the lexical category of the stem. Clusters such as [sm, sn, sl, sr], although well-formed with respect to the SSP, cannot be considered representative examples of core clusters because they do not show the same

[3] Medial [fr] and [fl] are more rare and in most cases they are found in words of foreign orgin. However, I am not concerned here with the relative well-formedness of core clusters and will ignore this fact for the purposes of this analysis.

distributional properties of core clusters. Unlike the latter, these clusters occur in initial and medial position only in borrowed words or morphologically complex words. A few representative examples are given below:

(6) smeraldo (Latinate[4]) "emerald"
smalto (French smalt) "enamel"
asma (Latinate) "asthma"
sleale (s+leale) "not loyal"
islamico (foreign) "Islamic"
sregolato (s+regola) "immoderate"

Similarly, s+fricative clusters, I believe, cannot be considered core obstruent clusters either because they also only occur in morphologically complex words and are never found in medial position in simplex words with a very few exceptions of words of latinate origin. A few representative examples are given below:

(7) sfera (latinate) "sphere"
sfarzo (Neapolitan) "pomp"
sfoglia (s+foglia) "layer"
asfalto (latinate) "asphalt"
asfissia (latinate) "asphyxia"

The following chart recapitulates the distributional properties of the four types of clusters discussed in monomorphemic words of the native vocabulary.

[4] I use Latinate for words of both Latin or Classical Greek origin.

(8)

	Initial	Medial
a. Core clusters	YES	YES
b. s+STOP	YES	YES
c. s+Sonorant	NO	NO
d. s+Fricative	NO	NO

Chart (8) clearly shows that s+STOP clusters share the same distributional properties of Core Clusters and can therefore safely be considered regular phonotactics. On the other hand, s+Fricative and s+Sonorant do not share any of the distributional properties of Core Clusters. As shown above, these clusters only occur in borrowings or morphologically complex words. For this reason, I believe they cannot be considered to satisfy the regular phonotactics of Italian.

In conclusion, Italian allows only one type of obstruent clusters, i.e. the unmarked FS s+STOP. FF clusters, although present in the language, are not considered well-formed in terms of the system of constraint on the manner dimension. The clusters that do occur but are not considered regular phonotactics occur because of some other constraints preserving morphological information or non-native phonotactics.

5.4.2 Syllabification

In the previous section, I have argued that only two types of clusters can be considered representative of the native phonotactics, i.e. core clusters consisting of an obstruent (except /s/) and a sonorant, and s+STOP clusters. It has been

shown that these two groups of clusters behave differently phonologically. In medial position, s+STOP clusters[5], but not core clusters, are unambiguously syllabified heterosyllabically, with the /s/ in the coda of the preceding syllable and the second member of the sequence in the onset of the following syllable (Chierchia (1983); Kaye, Lowenstamm and Vergnaud (1990); Burzio (1989); Davis (1990); Harris (1994)). There are two main arguments that favor the heterosyllabicity of medial s+STOP clusters. The first argument comes from vowel length and the second from phonotactics patterns.

In Italian, vowel length is predicatable. Stressed vowels in open syllables are lengthened:

(9) a.	fa:.to	"fate"	b. [k]a:pra	"goat"
	me:.ro	"pure"	sa:.[k]ro	"sacred"
	pe:.lo	"hair"	re:.tro	"behind"

On the other hand, stressed vowels in closed syllables are short:

(10)	fat.to	"fact"
	man.to	"coat"

Since stressed vowels preceding an s+STOP cluster are systematically short, these clusters must not form complex onsets in medial position, but rather /s/ must close the preceding syllable, as in (11).

(11)	pas.ta	"pasta"
	ves.pa	"wasp"
	mos.[k]a	"fly"

[5] This process affects also s+Consonant clusters.

The second argument is based on phonotactics considerations, and, in my opinion, is not as strong as vowel length. Chierchia argues that there are no monomorphemic words in Italian such as **pelsto* or **persto*. He attributes this gap to the fact that, in Italian, there is only one post-nucleic position in the rime. The gap confirms the ill-formedness of s+STOP clusters because syllabification in the case of this words would be impossible. If, indeed, tautosyllabic s+STOP clusters were well-formed, there would be no problem syllabifying **persto* as **per.sto*. It must be pointed out, however, that a few words containing a medial sequences of a sonorant followed by an s+STOP do indeed occur. Some representative examples are given in (12)

(12) a. perspicace "acute"
b. pe(r)spirare "exhale"
c. co(n)stare "consist of"
d. co(n)statare "notice"

Except for (12a), all other examples are derived from words of Latinate origin, that were morphologically complex in the source language. Parenthesis around the initial sonorant of the sequence indicates that both forms exist in the language[6]. A word such as *perspicace*, therefore can only be syllabified as *per.spicace* given the fact that Italian codas only allow one post-nucleic position. Based on this data, I believe, this second argument is not as strong as the vowel length argument. I argue, therefore, that the presence of words such as the ones in

[6] In my speech, I prefer the full form.

(12) supports the view that s+STOP clusters are not ill-formed in the language, regardless of their heterosyllabicity in (11). I will show that their medial syllabification follows from independent principles.

Based on the fact that in medial position s+STOP clusters are never tautosyllabic, Chierchia (1983), Kaye, Lowenstamm and Vergnaud (1990), Burzio (1989), Davis (1990) and Harris (1994) have argued against the well-formedness of initial s+STOP onsets as well. Chierchia (1983), for example, assumes that /s/ is a stray consonant word initially throughout the word phonology. A later adjunction rule incorporates it into the onset and creates an s+STOP cluster.

I argue that medial syllabification is not evidence for the ill-formedness of s+STOP onsets, but is rather an effect derived from the interaction of basic syllable structure constraints. Unlike previous analyses, in which vowel length was considered evidence for the ill-formedness of initial s+STOP clusters, in the analysis I present, vowel length is not taken to constitute evidence for the fact that these clusters do not form well-formed onsets. The basic insight of the analysis I will present here is that whereas in medial position it is better to syllabify s+STOP as for example [s.t] rather than [.st] in terms of syllable structure, in initial position s+STOP clusters can only be syllabified as [.st] because, in Italian, deletion and epenthesis are not possible options. This intuition is formalized in the following tableau:

(13)

/stato/	NUCLEUS	MAX-IO	DEP-IO	SSP[7]
a. ☞ sta.to				*
b. s.ta.to	*!			
c. es.ta.to			*!	
d. ta.to		*!		

Candidate (b), a candidate in which /s/ is syllabified in the coda of a nucleusless syllable, fails because it violates a constraint that requires that all syllables have a nucleus (NUCLEUS). Candidates (c) and (d) fail because repairing a cluster that violates the SSP is worse than allowing it to surface given the ranking MAX-IO, DEP-IO >> SSP.

Under the assumption that s+STOP clusters constitute well-formed onsets, I will explain the fact that they are unambiguously heterosyllabic in medial position in terms of best satisfaction of basic syllable structure constraints. In previous accounts the medial syllabification of these clusters followed from the fact that s+STOP onsets were actually disallowed in the language. Their occurrence word initially was explained in terms of special representations or post-lexical syllabification rules. In the present proposal, I show that there is no need to stipulate that s+STOP clusters are formed by special rules. I argue that they are regular well-formed onsets. Their medial syllabification just follows from

[7] For simplicity, I am using the portmanteau constraint SSP in place of *Plateau and *Reversal.

minimal violations of independently motivated constraints on syllable structure. The constraints that determine the syllabification of medial s+obstruent clusters are given in (14) below:

(14)

- ***COMPLEX**[8]

  No more than one C may associate to the onset or coda node

- **NOCODA**

  Codas are disallowed

Given any input containing a medial sequence as in "pasta", syllabification results from the interaction of *COMPLEX and NOCODA as shown in the following tableau:

(15)

/pasta/	*COMPLEX	NOCODA
a. ☞ pas.ta		*
b. pa.sta	*!	

Candidate (a), in which the /s/ is syllabified in the coda of the preceding syllable, wins over candidate (b), in which the /st/ cluster is syllabified tautosyllabically, because candidate (a) only violates NOCODA, but satisfies higher ranked *COMPLEX. These constraints must be low ranked in the constraint hierarchy

[8] Clements (1997) argues that this constraint is actually two separate constraints *COMPLEX^{Coda} and *COMPLEX^{Onset}. Also recall that for me *COMPLEX is indeed a portmanteau constraint.

of Italian, given the fact that both complex syllable positions as well as codas are allowed to surface in the first place.

In order to ensure that clusters that obey the SSP are syllabified as tautosyllabic onset clusters, the two syllable structure constraint must be crucially dominated by a third constraint. The constraint at stake is the Syllable-Contact-Law Constraint (Murray and Venneman 1983; Clements 1990; Hironymous 1999). The constraint must crucially be formulated as a negative constraint in the following way:

(16) Syllable-Contact-Law
A coda must not be lower in sonority than the following onset.

Interaction of Syllable-Contact-Law with *COMPLEX accounts for the syllabification of medial clusters that obey the SSP both in the case of an initial stop and fricative, as shown in the tableaux below:

(17)

/metro/	Syll-Contact-Law	*COMPLEX	NOCODA
a. ☞ me:.tro		*	
b. met.ro	*!		*

(18)

/africa/	Syll-Contact-Law	*COMPLEX	NOCODA
a. ☞ a:.frica		*	
b. af.rica	*!		*

As stated, the constraint applies non-vacuously only if the segment in the coda is lower in sonority than the segment of the following onset, as shown in tableaux (17) and (18). On the contrary, the constraint is vacuously satisfied if the segment in the coda is higher in sonority than the one in the following onset, as shown in the following tableau:

(19)

/sarto/	Syll-Contact-Law	*COMPLEX	NOCODA
a. ☞ sar.to			*
b. sa.rto		*!	

The constraint is also vacuously satisfied if the segments are equal in sonority as in the case of s+STOP clusters. Syllabification of these types of clusters than will depend exclusively on lower ranked *COMPLEX and NOCODA, as shown in (20) below:

(20)

/pasta/	Syll-Contact-Law	*COMPLEX	NOCODA
a. ☞ pas.ta			*
b. pa.sta		*!	

Finally, this analysis so far incorrectly forces syllabification of medial s+Sonorant sequences into tautosyllabic onset clusters, because /s/ is lower in sonority than any sonorant segment in Italian.

(21)

/asma/	Syll-Contact-Law	*COMPLEX	NOCODA
a. ☛ as.ma	*!		*
b. ✝ a:.sma		*!	

This is not a correct syllabification for a word such as “asma” because of the fact that the initial vowel is short, which again suggests that these clusters also are syllabified heterosyllabically. In section 5.4.1, I have argued that s+Sonorant clusters cannot be considered well-formed clusters according to the regular phonotactics of Italian due to the fact that they are only allowed in borrowing or morphologically complex clusters. Their ill-formedness must therefore correspond to some constraint, or constraint system presumably having to do with sonority distance, that bans their occurrence. I will informally call this constaint *s+Sonorant. However, I believe that an explanation for the pattern found in

Italian lies somewhere in the right evaluation metric for relative well-formedness among core clusters, which is outside the scope of this dissertation. The existence of this constraint then will force heterosyllabicity in these clusters:

(22)

/asma/	*s+Sonorant	Syll-Contact-Law	*COMPLEX
a. ☞ as.ma		*	
b. a.sma	*!		*!

In conclusion I have shown that medial syllabification is not evidence for the ill-formedness of s+STOP clusters. On the contrary, their medial syllabification is only the result of the interaction of basic syllable structure constraints.

5.4.3 Morphological Alternations

Another piece of evidence that has traditionally been used in support of the claim that initial s+STOP clusters do not form onset clusters, is the choice of the masculine definite article allomorph[9]. This morpheme in Italian has two forms *il* and *lo*. The allomorph *il* can be considered to be the default case since it occurs with words starting in single consonants or clusters that obey the SSP. The allomorph *lo* , instead, occurs with words starting with either s+STOP clusters[10],

[9] See Burzio (1989) for a more comprehensive list of elements that show similar alternations between s+STOP clusters and core clusters.
[10] Indeed s+consonant.

or one of /ʎ, ɲ, ʃ, ts, dz/, which have been argued to be underlyingly long segments (Chierchia 1983) because they do not show the same alternations as the other consonants, or a vowel[11]. The alternation is shown in (23) below:

(23)

Distribution of *il*	Distribution of *lo*
• <u>Single consonants</u>: il ponte the bridge il topo the mouse il [k]orpo the body il bagno the bath il dente the tooth il gatto the cat il [tʃ]ielo the sky il [dʒ]iorno the day il forno the oven il volo the flight il segno the sign il mondo the world il nome the name il ladro the thief il regalo the gift	• <u>Long consonants</u>: lo [ʃ]iopero the strike lo [ts]io the uncle lo [dz]aino the knapsack lo [ɲ]occo the dumpling
• <u>Core clusters</u> il proposito the purpose il plotone the platoon il treno the train il drappo the cloth il [k]ranio the skull	• <u>Other clusters</u> lo stato the state lo sforzo the stress lo sposo the groom lo smeraldo the emerald

[11] I will only discuss the alternation in the case of words beginning with clusters, since the form *lo* is truncated before vowels, e.g. lo+ozio → lozio.

From the distribution of the two allomorphs, it can be argued that *il* is the default allomorph, because it occurs with single consonant onsets and core clusters, whereas *lo* is the special case because it occurs in a more restricted set of environments. In particular it occurs with the long consonants and s+C clusters. I will argue therefore that there is a markedness relationship between the two allomorphs based on their distributional properties which makes *il* the least marked of the two by virtue of being the default allomorph.

In Chierchia's analysis, the selection of *lo* rather than *il* before words such as the ones in the right-hand column follows from the assumption that the /s/ in the initial s+STOP clusters remains stray until the coda rule syllabifies it with the preceding rime, after incorporation of the article. Since Italian allows only one postnucleic position, it is clear why [los.tato] rather than *[ils.tato] is the correct form.

In the analysis I propose, on the contrary, the choice of the allomorph *lo* in words that begin with s+STOP clusters follows straightforwardly from the same constraint interaction that forces a medial s+STOP cluster to be syllabified heterosyllabically. This is illustrated in the following tableau:

(24)

/DEF+stato/	*COMPLEX	NOCODA
a. ils.ta.to	*!	*
b. il.sta.to	*!	*
c. lo.sta.to	*!	
d.☞ los.ta.to		*

Candidates (a) through (c) are all out because they violate dominant *COMPLEX, in particular candidate (a) contains a complex coda whereas both (b) and (c) contain a complex onset. Candidate (d) is optimal because it minimally violates NOCODA.

However, an analysis based solely on the above syllable structure constraints, Syll-Contact-Law, *COMPLEX and NOCODA, would favor the selection of *lo* also in the context where *il* should instead appear. This is shown in tableau (25) below.

(25)

/DEF+treno/	Syll-Contact-Law	*COMPLEX	NOCODA
a . ilt.re.no	*!	*	*
b. lot.re.no	*!		*
Desired winner: c. ✟ il.tre.no		*	*!
Wrong winner: d. ☛ lo.tre.no		*	

As the tableau shows, the Syll-Contact-Law immediately eliminates the two candidates in which a cluster /tr/ is syllabified heterosyllabically. Candidate (c), which is the desired winner, however, loses in the competition with candidate (d) because of its violation of NOCODA. An analysis based solely on syllable structure constraints penalizes the default allomorph *il* due to the fact that, in terms of syllable structure, *il* is more marked than *lo*. *lo* has the unmarked syllable structure CV, whether *il* both lacks an onset and contains a coda consonant and has, therefore, the more marked syllable structure VC. In a purely phonological analysis, there is no apparent explanation for why *il*, rather than *lo*, is the default allomorph and, in particular, for why *il*, rather than *lo*, should occur with words beginning with single consonants, as the data in (26) shows:

(26)	il.ti.po	*lo.ti.po	the type
	il.na.so	*lo.na.so	the nose
	il.sa.le	*lo.sa.le	the salt
	il.[dʒ]e.lo	*lo.[dʒ]e.lo	the ice

As a matter of fact, the occurrence of *il* with words such as the ones in (26) creates a more marked syllable structure than what *lo* would create with the same words. This is shown in tableau (27), where I evaluate the two candidates against the syllable structure constraints, ONSET, which requires that all syllables have an onset, and NOCODA.

(27)

/DEF+tipo/	ONSET	NOCODA
Wrong winner: a.☛ lo.ti.po		
Desired winner: b. ✝ il.ti.po	*	*

Tableau (27) shows that candidate (b), the desired winner, incurs violations of both ONSET and NOCODA, and is, therefore, a more marked candidate than (b) which instead satisfies both syllable structure constraints.

The data in (26) can only be explained by assuming a markedness relationship between the two allomorphs based on their distribution[12]. From this point of view, *il* is the unmarked form of the definite article, by virtue of being the default allomorph, and *lo* is the marked one since it is the special case. This markedness relationship is implemented via the relative ranking **lo* >> **il*, in which the markedness constraint corresponding to the default allomorph is lower ranked than the constraint corresponding to the predictable one. By ranking this sub-hierarchy between *COMPLEX and NOCODA, the right surface form in the case of a stem beginning with a core cluster is predicted. In tableau (28) below, I

[12] J. McCarthy developed this idea in the 1993 seminar at University of Massachusetts. The idea was reported to me by L. Benua (p.c.). Davidson (1999) also explores this idea.

only show the relevant part of the hierarchy :

(28)

/DEF+treno/	Syll-Contact-Law	*COMPLEX	**lo*	NOCODA
a . ilt.re.no	*!	*		*
b. lot.re.no	*!		*	*
c.☞ il.tre.no		*		*
d. lo.tre.no		*	*!	

Candidates (c) and (d) both incur a violation of *COMPLEX, however, candidate (c) contains the unmarked form of the definite morpheme and wins regardless of its NOCODA violation.

This also predicts the right alternation in the case of stems beginning in single consonants and with s+STOP clusters, as shown in tableaux (29) and (30) respectively.

(29) DEF + words beginning in simple onsets

/DEF+tipo/	**lo*	**il*	ONSET	NOCODA
a. lo.ti.po	*!			
b. ☞ il.ti.po		*	*	*

Tableau (29) shows that when *COMPLEX is not at issue, the relative markedness of the allomorphs determines the choice of the least marked of the two, i.e. *il*. However, when higher ranked *COMPLEX is at stake, it forces the

choice of the more marked allomorph *lo*, which gives a less marked syllable structure. This is shown in tableau (30) below.

(30) DEF + words beginning with an s+Stop cluster

/DEF+stato/	*COMPLEX	**lo*	**il*	NOCODA
a. ils.ta.to	*!		*	*
b. il.sta.to	*!		*	*
c. lo.sta.to	*!	*		
d.☞ los.ta.to		*		*

In this section I have shown that the different syllabification patterns of s+STOP clusters in initial and medial positions does not necessarily imply that s+STOP clusters are ill-formed onsets and require, therefore, special rules or representations to account for their occurrence in initial position. I show, on the contrary, that the different syllabification patterns follow straightforwardly from the constraint ranking of the language.

So far, I have argued that s+STOP onsets are the best-formed clusters among all the obstruent clusters because they are doubly unmarked. They are unmarked along the dimension where the feature [continuant] is relevant and unmarked along the place dimension, because they surface with the least marked place in a position where place contrast is harder to maintain. Moreover, I have shown that one of the strongest pieces of evidence in support of the ill-formedness of initial s+STOP clusters, i.e. their syllabification in medial position

and the masculine definite article alternation in Italian, can be explained in terms of minimal violations of basic syllable structure constraints. i.e. *COMPLEX and NOCODA, and, does therefore not constitute evidence for the ill-formedness of s+STOP onsets.

In the next section I will examine the case of Sanskrit reduplication and show that this process also is not evidence for the fact that s+STOP clusters are ill-formed in the language.

5.5 Sanskrit Perfect Reduplication

Another piece of evidence used to argue for the ill-formedness of s+STOP onsets comes from Sanskrit perfect reduplication (Steriade 1984). I show, however, that the Sanskrit facts themselves do not provide any evidence for the ill-formedness of s+STOP clusters. I argue that, in the case of roots beginning with obstruent clusters, reduplication is constrained by relative markedness of fricatives and stops.

The perfect reduplicative prefix in Sanskrit consists of a CV syllable whose segmental material is entirely copied from the verbal root. When the root begins with a core cluster, the first member of the cluster is consistently copied into the reduplicant. If the root begins with an obstruent cluster, the stop is always copied into the reduplicant, regardless of whether it constitutes the first or second member of the clusters. The different behavior of the two classes of clusters is shown in the following data taken from Steriade (1982).

(31)	Root	Perfect	Gloss
a. Core clusters:			
	prac^{h}	pa-prac^{h}	“to ask”
	dru	du-druv	“to run”
	gla:	ja-gla:	“to be weary”
	smi	si-ʃmi	“to smile”
	sru	su-ʃru	“to flow”
	mluc	mu-mluc	“to set”

b. Obstruent clusters:

SF:	tsar	ta-tsar	“to approach stealthily”
	psa:	pa-psa:	“to devour”
	kʃip	ci-kʃip	“to throw”
FS:	stu	tu-ʃtu	“to praise”
	spu	pu-sp^{h}u	“to burst”
	skand	ca-skand	“to leap”

In her analysis of Sanskrit, Steriade interprets the reduplication patterns as evidence for the heterosyllabicity of s+STOP clusters. Since s+STOP clusters, of all the clusters, are the only ones that reduplicate the second segment of the cluster rather than the first one, she argues that they must be heterosyllabic. In particular, in her analysis, these clusters do not form regular onsets, since the initial fricative is a stray consonant, i.e. a consonant left unassociated to a syllable position. Because the initial /s/ is stray, it is invisible to reduplication and therefore cannot be copied into the reduplicant. Reduplication, thus, copies the first syllabically associated member of the cluster.

I will argue that the Sanskrit data does not provide evidence for the heterosyllabicity of s+STOP clusters. The pattern of reduplication is not based on the first syllabically associated member of the cluster, but is rather on relative sonority and relative markedness. In particular, in the case of core clusters, the least sonorous member of the cluster is reduplicated. In the case of obstruent

clusters, instead, reduplication copies the least marked obstruent, i.e. the stop[13]. This proposal is based on the assumption that, unlike core clusters, obstruent clusters are not regulated by principles of sonority since fricatives and stops are assigned the same sonority value on a universal scale.

In the next section, I will first provide an analysis of the pattern of reduplication in obstruent clusters. I will only briefly discuss reduplication in the case of core clusters, since it requires a sonority-based formalism which is beyond the scope of this dissertation[14].

5.5.1 The Analysis of Reduplication of Obstruent Clusters

The data showing the reduplication pattern in the case of obstruent clusters is repeated below.

(32)

SF:	tsar	ta-tsar	“to approach stealthily”
	psa:	pa-psa:	“to devour”
	kʃip	ci-kʃip	“to throw”
FS:	stu	tu-ʃtu	“to praise”
	spu	pu-sp^{h}u	“to burst”
	skand	ca-skand	“to leap”

[13] Relative sonority could be invoked also in the case of obstruent clusters under the assumption that fricatives and stops differ in sonority. In both FS and SF clusters, the stop is reduplicated, which would be the least sonorous of the two (Hironymous 1999). As argued in the previous chapters, however, stops and fricatives must crucially be equal in sonority in order to explain the phonotactics of obstruent clusters. This analysis is therefore untenable in the context of this dissertation.

[14] See Clements (1989), Smolensky (1995) and Hironymous (1999) for a discussion of relative complexity of CV syllables and core clusters.

The data clearly shows that the reduplicated morpheme consists of the [-continuant] segment of the cluster irrespective of its position in the cluster. Unlike Steriade's characterization, reduplication is not taken here to be about first or second member of the cluster, but rather about relative markedness on the dimension of the feature [continuant]. In this respect, I argue that stops are the least marked obstruents because they are more harmonic than fricatives with respect to the relevant markedness hierarchy on the dimension of the feature [continuant]:

(33) *[+continuant] >> *[-continuant]

The fixed ranking in (33) is based on the fact that typologically stops are more common segments than fricatives. Moreover, as already pointed out earlier, there are languages that lack fricatives but no languages that lack stops (Maddieson 1984).

The fact that the least marked member of the cluster is copied into the reduplicant is not a surprise, since the product of reduplication is often a less marked structure than the one present in the root (McCarthy and Prince 1994). This pattern of reduplication is a type of The Emergence of the Unmarked, i.e. TETU. The idea is that the phonologically unmarked structure emerges in a certain domain, in which the more marked structure is banned, though the former is not required in the language as a whole.

My analysis of Sanskrit reduplication is based on the model of Correspondence Theory proposed in McCarthy & Prince (1995). According to this model, correspondence relations exist between the input and the output and between the base and the reduplicant.

In Sanskrit the fact that only one consonant is copied into the reduplicant is determined by the fact that the markedness constraint *COMPLEX dominates the faithfulness constraint that regulates segment correspondence between the base and the reduplicant. The constraint is defined below:

(34) MAX-BR – Every segment of the base has a correspondent in the reduplicant.

Tableau (35) below shows how the interaction of these two constraints determines the shape of the reduplicant in Sanskrit.

(35)

Perf+tsar	*COMPLEX	MAX-BR
a. tsa-tsar	**!	
b. ☞ ta-tsar	*	*

Both candidates (a) and (b) incur a violation of *COMPLEX because of the complex onset in the base. However, candidate (a) violates it twice because the reduplicant also contains a complex onset. Given the fact that a violation of *COMPLEX is worse than a failure to full copy, the optimal shape of the reduplicant is a simple onset. I argue that the choice of which of the two obstruents is copied into the reduplicant is determined by markedness.

Besides the fixed hierarchy in (33), the following two constraints are used in the analysis.

(36) IO-Ident(cont) – Output correspondents of an input [αcontinuant] segment are also [αcontinuant]

(37) BR-Ident(cont) – Reduplicant correspondents of a base [αcontinuant] segment are also [αcontinuant].

Both IO-Ident(cont) and BR-Ident(cont) must dominate the markedness constraint in order to predict reduplication of the [-continuant] segment with a root in which both segments occur, but also allow reduplication of the [+continuant] segment from a root without a complex onset. The first two tableaux below show reduplication in the case of a root beginning with a FS cluster and a SF cluster respectively. The last tableau shows, instead, reduplication in the case of a hypothetical root beginning with a fricative in a simple onset.

(38)

Perf+stu	BR-Ident(cont)	*[+cont]	*[-cont]
a. $s_{ij}u\text{-}ʃ_i t_j u$	t!	**	*
b. $t_{ij}u\text{-}ʃ_i t_j u$	ʃ!	*	**
c. $s_j u\text{-}ʃ_i t_j u$	t!	**	*
d. $t_i u\text{-}ʃ_i t_j u$	ʃ!	*	**
e. $s_i u\text{-}ʃ_i t_j u$		**!	*
f.☞ $t_j u\text{-}ʃ_i t_j u$		*	**

In this tableau violation of the BR-Ident(cont) has been indicated by the segment responsible for the violation. I have considered all possible correspondence relations between the base and the reduplicant. In candidates (a) and (b) both segments of the complex onset of the root have the same correspondent in the reduplicant. In both candidates (a) and (c) the violation of BR-Ident(cont) is due to the fact that the correspondent of /t/ in the reduplicant has the positive value of the feature [continuant] rather than the negative value. In candidate (b) and (d), on the contrary, the correspondent of /s/ is a [-continuant] segment. Candidate (e) and (f) satisfy BR-Ident(cont). In candidate (e) and (f), the two corresponding segments have the same values for the feature continuant. The /t/ of the root morpheme in candidate (e) and the [ʃ] of candidate (f) have no correspondents in the reduplicant and, consequently, do not violate the constraint. Candidate (e), however, loses over candidate (f) because it receives an additional violation of *[+cont] for the fricative in the reduplicant. Candidate (f) is therefore the optimal candidate because it contains a more harmonic structure in the reduplicant, i.e. a [-cont] segment.

In tableau (39) below, which contains a root with an initial SF cluster, I have only considered the two candidates that satisfy BR-Ident(cont) as explained above.

(39)

Perf+tsar	BR-Ident(cont)	*[+cont]	*[-cont]
a. s_ja-$t_i s_j$ar		**!	*
b. ☞ t_ia-$t_i s_j$ar		*	**

Also in this case, the candidate with the stop in the reduplicant is the most harmonic of the two.

The constraint ranking introduced in this chapter, besides predicting the observed pattern of reduplication, allows a root [+cont] segment to be reduplicated when it occurs as a simple onset, as shown in the following tableau:

(40)

Perf+sai	BR-Ident(cont)	*[+cont]	*[-cont]
a. ☞ sa-sai		**	
b. ta-sai	*!	*	*

In the case of core clusters the reduplicated segment is selected on the basis of relative sonority, i.e. the segment lower in sonority is selected irrespective of its position in the onset, as the data in (31a) shows. Hironymous (1999) accounts for such patterns by means of a constraint that evaluates the steepest sonority cline from the edge of the syllable to the nucleus. I will informally call this constraint "Sonority Cline"[15]. In the case of core clusters, the

[15] The constraint proposed in Hironymous (1999) is an alignment constraint that aligns consonants to the left of the syllable and ensures that such consonants will provide the steepest sonority cline from the edge of the syllable to the nucleus.

least sonorous segment is selected because it provides the steepest sonority cline, as shown in the following tableau:

(41)

Perf+prat	*COMPLEX	SonCline
a. ☞ pa-prac	*	
b. ra-prac	*	*!
c. pra-prac	**!	

Candidate (c) fails because it contains a complex onset in the reduplicant. Both candidates (a) and (b) tie on *COMPLEX. Candidate (a) reduplicates the stop from the base and has the steepest sonority cline, thus satisfying SonCline. Candidate (b) violates SonCline because, by reduplicating the sonorant from the base, the sonority cline between onset and nucleus is minimized.

Under the assumption that fricatives and stops are assigned the same sonority value, a constraint such as SonCline would not interfere if included in the analysis of Sanskrit reduplication because both types of segments would produce the same sonority cline and thus tie on that constraint. This is shown in tableau (42) below:

(42)

Perf+tsar	SonCline	*[+cont]	*[-cont]
a. sa-tsar		**!	*
b. ☞ ta-tsar		*	**

As shown, whether a fricative or a stop is reduplicated the constraint is still satisfied because both segments provide the steepest sonority cline, since as argued earlier they are equal in sonority.

In conclusion, I have shown that the Sanskrit perfect reduplication does not provide evidence for the ill-formedness of s+STOP onsets. On the contrary, it shows a pattern of reduplication in which the unmarked obstruents are copied into the reduplicant, therefore a clear case of The Emergence of the Unmarked in the reduplicant.

CONCLUSION

The main purpose of this dissertation has been to show that obstruent clusters constitute a unique phenomenon separate from core clusters. I argued that, unlike core clusters, obstruent clusters are not constrained by principles of sonority because fricatives and stops have the same sonority value. I show that a sonority-based approach is inappropriate for the phenomenon at hand.

From an empirical point of view, this dissertation contributes to the understanding of universal principles of syllable phonotactics by presenting the results of a cross-linguistic study on the occurrence and co-occurrence restrictions of obstruent clusters.

From a theoretical point of view, this dissertation contributes to the understanding and implementation of a number of tools available in Optimality Theory. In particular, I provide an explicit formalization of a technique of analysis, which I call the *Subset Strategy*. This strategy captures universal markedness relationships among forms without imposing any fixed ranking on the relevant constraints.

Within the proposal that obstruent clusters constitute a unique phenomenon and must be evaluated by means of principles other than sonority, this dissertation provides a new and original analysis of a long-standing problem in phonological theory, i.e. the phenomenon of s+STOP clusters. Unlike previous analyses, I argue that s+STOP clusters are special because they are unmarked

within the dimension of obstruent clusters, and not special because they are marked within the dimension of core clusters.

In what follows I summarize the content of each chapter of this dissertation and highlight its main contribution in the understanding of the phenomenon of obstruent clusters.

In Chapter 1, I provided an overview of the various issues related to sonority. I argued that obstruent clusters are different from core clusters and need therefore an analysis that does not make reference to principles of sonority. In the same chapter, I also introduced some of the optimality theoretical tools that I used in the rest of the dissertation. In particular, I introduced a method of analysis that allows us to capture markedness relationships among forms without fixed rankings.

Chapter 2, is devoted to the results that have emerged from a cross-linguistic study on the occurrence of obstruent clusters on the manner dimension. In this chapter I argued that FS clusters are the unmarked type for obstruent clusters. Moreover, I argued that the typology that results from the constraints proposed only gives rise to *harmonically complete* languages. *Harmonically incomplete* languages, i.e. the exceptions to the generalizations that I propose, are, however, found and they are argued to arise from other markedness dimensions that may interact with the proposed hierarchy.

In Chapter 3, I provided two case studies. Modern Greek exemplifies what could be called a misleading system. On the surface, a large number of obstruent

clusters are found. However, I argued that Modern Greek is in reality a fairly restrictive grammar in terms of the constraint system defining obstruent clusters. Most of the clusters found are allowed due to other independent constraints interacting with the constraints for obstruent clusters. Modern Greek also provides evidence for the unmarkedness of FS clusters because of the neutralization processes affecting SF, FF and SS clusters. The second case study is Nisqually. Nisqually provides an interesting example of a repair strategy for ill-formed obstruent clusters. In particular, in this language ill-formed clusters are repaired by obstruent syllabicity.

In Chapter 4, I have introduced the generalizations on the place dimension. In this chapter, I argued that an understanding of the phonotactics of obstruent clusters can best be understood by a system that makes explicit reference to phonetic facts. In particular, I showed that the most common pattern for obstruent clusters is coronal fricative followed by stop. I analyzed this pattern as neutralization of place in a position of weak perceptibility, i.e. the pre-consonantal position. I used English, German, Delaware and Takelma to provide examples of each language predicted by typology generated by the constraints proposed. In particular, I used Takelma as an example of a language in which the two dimensions interact in such a way as to give rise to an *harmonically incomplete* system, i.e. a system that violates the generalizations I propose.

Finally, in Chapter 5 I argued for the fact that s+STOP clusters are the best formed of all obstruent clusters. In particular, they are unmarked along the

manner dimension because they are FS clusters. On the place dimension, they are the least marked of all because the fricative in pre-obstruent position is a coronal. I argued against the view that the asymmetric behavior of s+STOP with respect to core clusters follows from the assumption that s+STOP clusters are marked clusters with respect to sonority. I argued, instead, that their asymmetric phonological behavior in languages such as Italian and Sanskrit follows from independent principles of syllable structure and markedness, and is not evidence for their markedness with respect to sonority.