Coronal assimilation and underspecification in Zurich German[1]

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Introduction

It has been repeatedly shown in the recent literature that coronals are "special" in a number of languages (Avery and Rice 1989; Rice and Avery 1991; Paradis and Prunet 1991; Cho 1991; Davis 1991; Yip 1991; McCarthy and Taub 1992; Hall 1992). The present paper focuses on assimilation phenomena and the status of coronals in Zurich German, a dialect of Swiss German spoken in the canton of Zurich in Switzerland. We show that both coronal stops and coronal nasals are best analyzed as underspecified for place, and coronal fricatives require (partial) specification. Thus coronals do not behave homogeneously with respect to underspecification. We begin by showing in section 1 the widespread process of assimilation in Zurich German, and in section 2 we discuss underspecification.

Zurich German contrasts the consonants shown in (1) below (Winteler 1876; Dieth 1950; Weber 1964). Stops have three underlying forms: lenis, fortis,[2] and aspirated, all voiceless. Lenes are plain stops, and fortes are realized with a high degree of articulatory effort and a heightened

(1) Consonants

		labial	coronal		velar	laryngeal
			alveolar	alveo-palatal		
Stops	lenis (plain)	p	t		k	
	fortis (glottalized)	pˀ	tˀ		kˀ	
	aspirated	pʰ	tʰ		kʰ	
Fricatives	lenis (short)	f	s	ʃ	x	h
	fortis (long)	f:	s:	ʃ:	x:	
Affricates		pf	ts	tʃ	kx	
Nasals		m	n		ŋ	
Liquids			r, l			
Glides		w		j		

subglottal pressure. We represent them as glottalized (tense) to emphasize the fact that the main difference between lenis and fortis stops lies in the intensity of articulation.

Fricatives have two underlying forms: lenes are short and fortes are long. Both forms are voiceless.

1.   Coronal assimilation

Coronal noncontinuant segments assimilate to a following labial or dorsal obstruent or nasal, as long as both the coronal and the following consonant belong to the same intonation phrase. This process is fairly regular and occurs in every speech style. Coronal fricatives also show assimilation, though to a lesser extent. The coronal liquids do not assimilate and we will ignore them for the rest of the paper.

1.1.   *Stop assimilation*

Coronal stop assimilation results in the formation of homorganic segments: geminates, affricates, or nasal stops. There is no difference between geminates coming from fortes and those arising from lenes. All geminate stops end up as fortis stops, presumably as a result of default specification. (2) shows assimilation of the lenis and (3) of the fortis coronal.

(2)   a.   gold-bach
           'golden creek'
           [kol*t*] + [*p*ɑx] → [kol*p:ˀ*ɑx]
      b.   gold-papier
           'gold foil'
           [kol*t*] + [*pˀ*ɑpiə̜r] → [kol*p:ˀ*ɑp*ˀ*iə̜r]
      c.   gold-grueb
           'goldmine'
           [kol*t*] + [*k*ruə̜p] → [kol*k:ˀ*ruə̜p]
      d.   gold-ggäiss
           'gold goat'
           [kol*t*] + [*kˀ*æɪs] → [kol*k:ˀ*æɪs]

(3)   a.   er   wet   bachche
           he wants bake
           'he wants to bake'
           [ve*tˀ*] + [pɑx:ə] → [ve*p:ˀ*ɑx:ə]
      b.   er   wet   poschte
           he wants go shopping
           'he wants to go shopping'
           [ve*tˀ*] + [*pˀ*oʃtə] → [ve*p:ˀ*oʃtə]

   c. er wet   gaa
      he wants leave
      'he wants to leave'
      [ve$t^{ʔ}$] + [kɑː] → [ve$k$ːʔɑː]
   d. er wet   ggschäfte
      he wants deal
      'he wants to deal'
      [ve$t^{ʔ}$] + [$k^{ʔ}$ʃæftə] → [ve$k$ːʔʃæftə]

Sequences of a stop and a fricative form an affricate whose place of articulation is that of the fricative. (4) shows assimilation of the lenis and (5) of the fortis coronal.

(4) a. gold fisch
       'goldfish'
       [kol$t$] + [fɪʃ] → [kolpfɪʃ]
    b. gold chind
       'gold child, (little) darling'
       [kol$t$] + [$x$int] → [kolkxint]
(5) a. er wet   fische
       he wants fish
       'he wants to fish'
       [ve$t^{ʔ}$] + [fɪʃə] → [vepfɪʃə]
    b. er wet   koche
       he wants cook
       'he wants to cook'
       [ve$t^{ʔ}$] + [xoxə] → [vekxoxə]

Coronal stops become nasal stops when assimilating to preceding nasals. There is no oral release of the closure, but the airflow escapes through the nose as a result of a lowering of the velum. We represent the nasal stop as [P] if the primary closure is labial. (6) shows assimilation of the lenis and (7) of the fortis coronal.

(6) gold-medallie
     'gold medal'
     [gol$t$] + [$m$edɑljə] → [golPmedɑljə]
(7) er wet   mälche
     he wants milk
     'he wants to milk'
     [ve$t^{ʔ}$] + [mælxə] → [vePmælxə]

Assimilation is always regressive: progressive assimilation is impossible for coronal stops, as can be seen from examples (8a)–(8d).

(8)   a.   en raab   dressiere
            a raven train
            'to train a raven'
            [rɑːp] + [tres:iə̯rə] → [rɑ:ptres:iə̯rə] (*[rɑ:p:ʔres:iə̯rə]
            or *[rɑ:t:ʔres:iə̯rə])

      b.   stop-tafle
            'stop sign'
            [ʃtopʔ] + [taflə] → [ʃtoptaflə]³ (*[ʃtop:ʔaflə] or *[ʃtot:ʔaflə])

      c.   schlaaf-tablette
            'sleeping pill'
            [ʃlɑːf] + [tʔabletʔə] → [ʃlɑːftabletʔə] (*[ʃlɑːfpabletʔə]
            or *[ʃlɑːstabletʔə]

      d.   crème-tùùrte
            'cream cake'
            [krɛːm] + [tʔuːrtə] → [krɛːmtuːrtə] (*[krɛːntuːrtə]
            or *[krɛːmpuːrtə])

Labials and velars do not assimilate to following places of articulation. This is illustrated by the following data with labial and dorsal codas. (9a) shows a sequence of two stops, (9b) a sequence of a stop and a fricative, and (9c) a stop and a nasal.

(9)   a.   en haag boue
            a fence build
            'to build a fence'
            [hɑːk] + [poy̯ə] → [hɑːkpoy̯ə] (*[hɑːk:ʔoy̯ə] or *[hɑːp:ʔoy̯ə])

      b.   en schnägg vertrampe
            a snail   crush
            'to crush a snail'
            [ʃnækʔ] + [fərtrampə] → [ʃnækfərtrampə]
            (*[ʃnækxərtrampə] or *[ʃnæpfərtrampə])

      c.   lugg   mache
            loose make
            'to make loose'
            [lʊkʔ] + [maxə] → [lʊkmaxə] (*[lʊPmaxə] or *[lʊkŋaxə])

Before laryngeals, glides, and vowels, the coronal consonants surface as such. This is readily explained if laryngeals do not have any place of articulation and if the places of articulation of vowels are represented on a tier different from those of consonants (Clements 1989).

(10) a.   golt hamschter
            'golden hamster'
            [kolt] + [hamʃtər] → [kolthamʃtər]

    b.   er wet   hei
          he wants home
          'he wants to go home'
          [ve$t^{ʔ}$] + [hæɪ] → [ve*th*æɪ]

    c.   golt erz
          'gold ore'
          [kol*t*] + [ɛrts] → [kol*t*ɛrts]

1.2. *Nasal assimilation*

The coronal nasal also assimilates to the place of articulation of the following labial or dorsal consonant. First, sequences of a coronal nasal and a nasal specified for place assimilate and geminate. (11) is an example of assimilation to a labial nasal. Notice that assimilation to a dorsal nasal [ŋ] cannot exist because, as in Standard German and in English, morphemes cannot start with a dorsal nasal.

(11)   en maa
        'a man'
        [ə*n*] + [*m*ɑ:] → [ə*m*:ɑ:]

Second, the coronal nasal assimilates to a following stop.

(12)   a.   en bueb
          'a boy'
          [ə*n*] + [*p*uə̯p] → [ə*mp*uə̯p]

     b.   en kascht
          'a guest'
          [ə*n*] + [*k*ɑʃt] → [ə*ŋk*ɑʃt]

     c.   en pöschtler
          'a postman'
          [ə*n*] + [*p^{ʔ}*øʃtlər] → [ə*mp*øʃtlər]

     d.   en kfalle
          'a favor'
          [ə*n*] + [*k^{ʔ}*fɑlə] → [ə*ŋk*fɑlə]

Finally, coronal nasals and fricatives assimilate as expected.[4]

(13)   a.   en chileturm
          'a church tower'
          [ə*n*] + [*x*iləturm] → [ə*ŋx*iləturm]

     b.   en vatter
          'a father'
          [ə*n*] + [*f*ɑt:ər] → [ə*mf*ɑt:ər]

Like coronal stops, nasals show only regressive assimilation, never progressive assimilation as in (14).

(14)   a.   en raab   naamache
            a   raven imitate
            'to imitate a raven'
            [rɑ:*p*] + [*n*ɑ:mɑxə] → [rɑ:*bn*ɑ:mɑxə][5] (*[rɑ:*bm*ɑ:mɑxə])
     b.   s   tram   nää
            the tramway take
            'take the tramway'
            [tʔrɑ*m*] + [*n*æ:] → [tʔrɑ*mn*æ:] (*tʔrɑ*m*:æ:])

In the case of nasals, too, only coronals assimilate. Labials and dorsals retain their place of articulation, as (15) shows. (15a) illustrates a sequence of a nasal and a stop and (15b)–(15c) of a nasal and a fricative.

(15)   a.   schuum-gummi
            'foam rubber'
            [ʃu:*m*] + [*k*umɪ] → [ʃu:*mg*umɪ] (*[ʃu:*ŋg*umɪ] or *[ʃu:*mb*umɪ])
     b.   schuum-chele
            'skimming-ladle'
            [ʃu:*m*] + [xelə] → [ʃu:*m*ɣelə] (*[ʃu:*ŋ*ɣelə] or *[ʃu:*m*velə])
     c.   lang-finger
            'pickpocket'
            [lɑŋ] + [*f*ɪŋər] → [lɑŋvɪŋər] (*[lɑŋɣɪŋər] or *[lɑ*m*vɪŋər])

1.3.   *Fricative assimilation*

Assimilation targeting coronal fricatives is much less frequent than assimilation targeting stops and nasals. Only the coronal fricative [s] assimilates, and only to coronal [ʃ]. Assimilation of [s] to [ʃ] applies both progressively and regressively, as long as both fricatives belong to the same prosodic word:[6]

(16)   a.   es schneit
            it snows
            'it is snowing'
            [ə*s*] + [*ʃ*næɪt] → [ə*ʃ*:næɪt]
     b.   ischsi   hei   choo
            is   she home come
            'did she come home?'
            [ω[ɪʃ] + [sɪ]] → [ɪʃ:ɪ]

(17) shows that regressive assimilation is blocked across prosodic word boundaries.

(17) häsch cigarette?
       'Do you have cigarettes?'
       [ω[hæʃ]] + [ω[sigaretʔə]] → [hæʃsigaretʔə] (*[hæʃːigaretʔə])

Coronal fricatives do not assimilate to noncoronals, as (18) shows.

(18) a. sächs fischli
          six   fish-DIM
          'six little fish'
          [sæxs] + [fɪʃlɪ] → [sæxsfɪʃlɪ *[sæxfːʃlɪ])
      b. sächs chüechli
          six   cookies-DIM
          'six little cookies'
          [sæxs] + [xyə̰xlɪ] → [sæxsxyə̰xlɪ] (*[sæxxːyə̰xlɪ])
      c. sächs meitli
          six   girls-DIM
          'six little girls'
          [sæxs] + [mæɪtlɪ] → [sæxsmæɪtlɪ] (*sæxfmæɪtlɪ])
      d. sächs göggli
          six   clock-DIM
          'six little clocks'
          [sæxs] + [kʔœkʔlɪ] → [sæxskœkʔlɪ] (*[sæxːkœkʔlɪ])

[ʃ] never assimilates to labial or dorsal places of articulation, as can be seen from (19).

(19) a. rasch   boue
          quickly build
          'built quickly'
          [raʃ] + [pou̯ə] → [raʃpou̯ə] (*[raʃpou̯ə] or *[raʃtou̯ə])
      b. rasch   mèèje
          quickly mow
          'mow quickly'
          [raʃ] + [mɛːjə] → [raʃ] + [mɛːjə] (*[raʃmɛːjə] or *[raʃnɛːjə])
      c. rasch   flüüge
          quickly fly
          'fly quickly'
          [raʃ] + f ly:gə] → [raʃfly:gə][7] (*[raʃːly:gə] or *[raʃːly:gə])
      b. fläisch-chüechli
          'meat cookies'
          [flæɪʃ] + [xyə̰xlɪ] → [flæɪʃxyə̰xlɪ] (*[flæɪxːyə̰xlɪ]
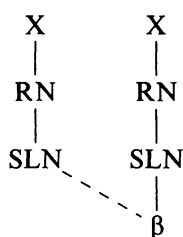   or *[flæɪʃːyə̰xlɪ])

[ʃ] patterns with the noncoronal fricatives with respect to assimilation data. Labial and dorsal fricatives retain their place of articulation: (20a) is a fricative and a stop, (20b) a fricative and a nasal, and (20c) two fricatives.

(20) a.   föif ggäisse
           'five goats'
           [fœɪ̯f] + [kæɪ̯s:ə] → [fœɪ̯fkæɪ̯s:ə] (*[fœɪ̯xkæɪ̯s:ə] or *[fœɪ̯fpæɪ̯s:ə])
      b.   ruuch-määl
           'flour'
           [ru:x] + [mæ:l] → ru:xmæ:l] (*[ru:fmæ:l] or [ru:xŋæ:l]
      c.   sach-fraag
           fact question
           'factual issue'
           [sax] + [fra:k] → [saxfra:k] (*[saf:ra:k] or *[sax:ra:k])
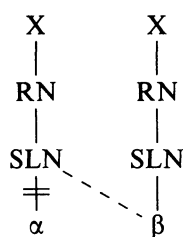

2.   Underspecification

We propose to analyze the assimilating coronals as underspecified. Hence assimilation can be viewed as a structure-filling process, rather than a structure-changing one.

(21) a. Assimilation as a   b. Assimilation as a

     structure-filling process   structure-changing process
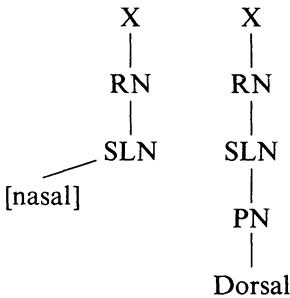

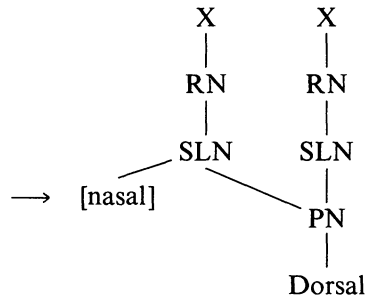
(RN = root node, SLN = supralaryngeal node)

An example of a coronal nasal assimilating to a following dorsal stop as in *en gascht* [ən] + [kɑʃt] → [əŋkɑʃt] 'a guest' is shown in (22).

(22) Nasal–stop assimilation

    a. Postlexical representation   b. Spreading

```
        X       X                          X       X
        |       |                          |       |
        RN      RN                         RN      RN
        |       |                          |       |
      _ SLN     SLN                      _ SLN     SLN
 [nasal]        |          →      [nasal]     \     |
                PN                              \  PN
                |                                  |
              Dorsal                            Dorsal
```

(PN = place node)

Representing coronals as underspecified makes assimilation a natural process. It is analyzed as filling a gap in the feature geometry of these segments.

Different theories of underspecification have been proposed that make slightly different predictions: radical underspecification, contrastive specification, and the node activation condition. All theories have in common that two phonological representations are available: the first, underspecified representation arises at early levels of the phonology and the second, specified representation in the course of derivation. They differ in postulating what has to be specified at the early levels. Let us examine the different theories of underspecification in the light of the Zurich German assimilation data. First, the radical underspecification theory (Kiparsky 1982, 1985; Archangeli 1984; Archangeli and Pulleyblank forthcoming) claims that predictable features are not specified in the underlying representation (UR) of a segment. In English, for example, voicelessness in obstruents is less marked than voicing, and thus only voiced obstruents are specified for voiceness. The value [−voice] is introduced by a redundancy rule in the course of the derivation. As to articulators, the coronal articulator is underspecified, because it is predictable and less marked, whereas labial and dorsal are specified in UR. Radical underspecification assumes that assimilation can be ordered before the assignment of complement feature values, so that ony marked features spread.

The second theory, contrastive specification (Steriade 1987; Mester

and Itô 1989), makes a different prediction: it requires that all contrastive segments, marked and unmarked, are specified underlyingly. Since labials and dorsals contrast with coronals, all three should be specified according to this approach. But if coronals are specified, assimilation cannot be a structure-filling process, it must be structure-changing. So the naturalness of Zurich German assimilation is not captured by this theory.

The third theory, the node activation condition of Avery and Rice (1989: 183), combines aspects of radical underspecification and contrastive specification. It posits that if two segments are contrasted by a secondary feature, then the dominating primary feature should be activated for both segments and the secondary feature that contrasts with the segments should be present in the underlying representation of the more marked segment. More specifically, since [s] and [ʃ] are distinguished by the secondary feature [anterior], this feature should be present in UR for [ʃ] and the primary coronal for both fricatives.

Assimilation of stops and nasals does not allow us to chose between radical underspecification and the node activation condition, since both theories predict them to be completely underspecified for place, as in (23).
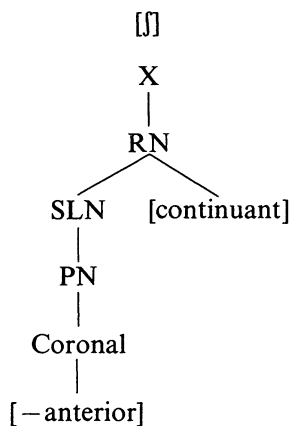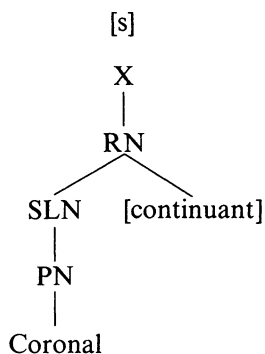
(23) Coronal stops and nasal

a. Stop   b. Nasal

     X   X
     | |
     RN   RN
     | |
     SLN   SLN
                       |
                     [nasal]

Now consider assimilation of [s] to [ʃ]. Remember that [s] only assimilates to [ʃ], as shown in (16), and [ʃ] does not assimilate at all. So we should not assume that [s] is totally underspecified for place features postlexically; otherwise, like the noncontinuant coronals, it would assimilate to following labial and dorsal places of articulation. Nor should we take [ʃ] to be underspecified, for it does not assimilate at all. For this reason, both coronal fricatives must be specified postlexically, [ʃ] completely and [s] partially.

We assume the representation (24a) for the coronal fricatives and (24b) for assimilation. Assimilation is spreading of the feature [−anterior].

(24) a. Coronal fricatives

```
            [s]                                      [ʃ]

             X                                        X
             |                                        |
             RN                                       RN
           /    \                                   /    \
        SLN    [continuant]                      SLN    [continuant]
         |                                        |
         PN                                       PN
         |                                        |
      Coronal                                  Coronal
                                                  |
                                              [−anterior]
```

b. Assimilation

```
        [s] + [ʃ]                                         [ʃ:]

       X       X                                      X        X
       |       |                                      |        |
       RN      RN              →                      RN       RN
      /      /    \                                  /       /    \
[cont]  SLN   SLN   [cont]                    [cont] SLN   SLN   [cont]
         |     |                                      |      |
         PN    PN                                     PN     PN
         |     |                                      |      |
     Coronal Coronal                             Coronal  Coronal
                |                                     `- - - - ┘
           [−anterior]                              [−anterior]
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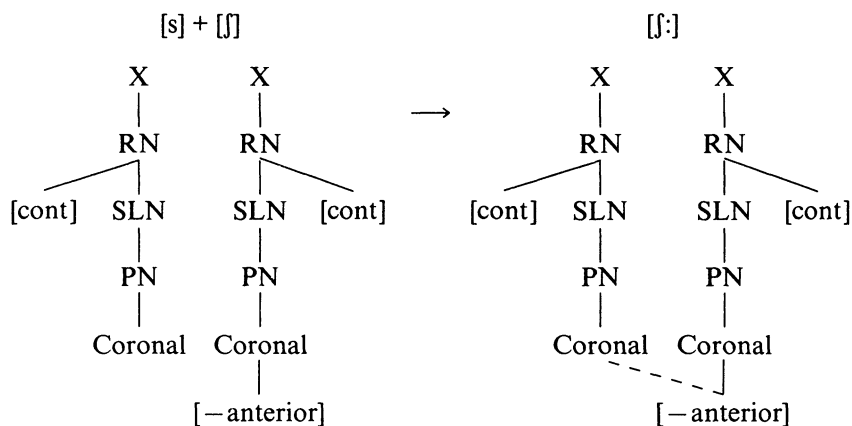
Thus when fricative assimilation applies, both coronals must be specified:
[ʃ] for coronal and [−anterior] and [s] for coronal, since assimilation to
other places of articulation is blocked.

    A complication arises in connection with morpheme structure

conditions. It has been shown for English (Davis 1991; Yip 1991) that coronals enjoy a freer distribution than labials and dorsals, since morpheme-internal consonant clusters allow more coronals than other segments. This is also true for both Standard German (Hall 1992) and Zurich German. The generalization can be expressed in a restrictive way if coronals are analyzed as underspecified. Yip formulates the consonant cluster condition (25).

(25)   *Cluster condition* (Yip 1991: 62):
        Adjacent consonants are limited to at most one place specification.

In other words, coronals do not count for place of articulation.

There is an apparent conflict between the assumption that coronal fricatives have to be specified (for assimilation) and the claim that they must be unspecified (for the cluster condition). Though Zurich German obeys (25) for stops and nasals, there are words like *wäschpi* [væʃpi], *raschple* [raʃplə], *hängscht* [hæŋkʃt], in which [ʃ] appears in the same consonant cluster as a labial or dorsal consonant. If [ʃ] is underlyingly specified for place, then (25) does not hold for Zurich German.
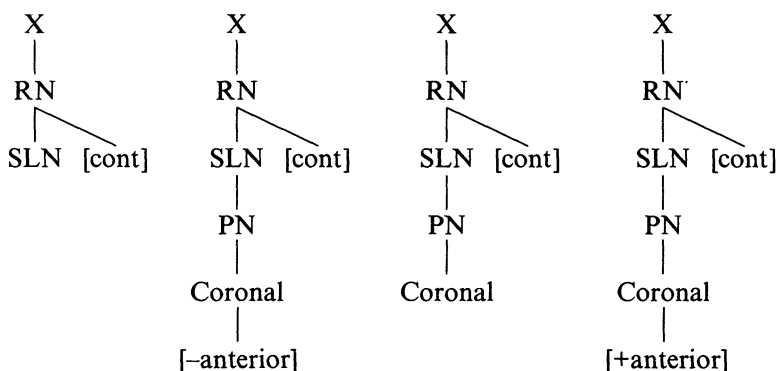
Our solution to this paradox is that most fricatives are not specified at the time the cluster condition applies. Exactly those [ʃ] that would violate the cluster condition are underlyingly unspecified: they get their coronal and [−anterior] specification later in the course of lexical derivation as a consequence of a context-sensitive redundancy rule, called ʃ-default, (27b).[8] A coronal fricative becomes [ʃ] before another tautosyllabic consonant, (26a), otherwise it is [s], (26b). Some examples of [ʃ] that must be underlyingly specified for coronal and [−anterior] are given in (26c). In these positions, before a vowel or as the sole consonant in the coda, [ʃ] contrasts with [s]. We assume that these [ʃ] are specified in UR (but not [s]).

(26)   a.   ham*sch*ter 'hamster', wä*sch*pi 'wasp', häng*sch*t 'stallion', *sch*patz 'sparrow'
        b.   *s*ächs 'six', äs*s*e 'to eat', chèè*s* 'cheese'
        c.   *sch*uufle 'shovel', *sch*iff 'ship', blamaa*sch* 'disgrace'

When the ʃ-default rule applies, the coronal node must be activated for all unspecified continuants, as in (27c). Thus when [ʃ] becomes totally specified, [s] becomes partially specified. It is this partial specification that blocks spreading of dorsal and labial to coronal continuants; see (18). Postlexically, coronal fricative default assigns the default value [+anterior] to all coronal continuants still unspecified for this feature, and they surface as [s], (27d).

(27) *s*/ʃ lexical default rules

    a. UR   b. ʃ- default   c. Node activation d. Coronal fricative
                                                         default

$$
\begin{array}{cccc}
\text{X} & \text{X} & \text{X} & \text{X} \\
| & | & | & | \\
\text{RN} & \text{RN} & \text{RN} & \text{RN}^{\cdot} \\
& & & \\
\text{SLN [cont]} & \text{SLN [cont]} & \text{SLN [cont]} & \text{SLN [cont]} \\
& | & | & | \\
& \text{PN} & \text{PN} & \text{PN} \\
& | & | & | \\
& \text{Coronal} & \text{Coronal} & \text{Coronal} \\
& | & & | \\
& \text{[-anterior]} & & \text{[+anterior]}
\end{array}
$$

Now we are in a position to compare the two models. The node activation condition predicts that fricatives are specified for coronal (and [ʃ] for [anterior]) underlyingly. But we showed that this is not a desired result, since parts of them must be unspecified in UR with respect to the cluster condition. Thus, only radical underspecification makes the right predictions for the Zurich German coronals. All obstruents are underspecified underlyingly, except some instances of [ʃ], but they acquire their specifications at different stages of the derivation. The fricatives must be specified for coronal at the end of the lexical derivation, at the word level, and the stops and nasals get their coronal specification later, only postlexically, after assimilation across word boundaries has taken place.

    To sum up, the assimilation facts and the consonantal distribution in morphemes in Zurich German lead us to assume that coronals are underspecified underlyingly. However, whereas the coronal stops and nasals get their place specification at a late postlexical level, the coronal fricatives must be partially specified at an earlier stage.

Notes

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2. For the distinction lenis vs. fortis, see Kohler (1984).
3. A neutralization process changes a fortis stop into a lenis stop in every environment, except intervocally (Moulton 1986). Examples of neutralization appear in (8b), (9b)–(9c), (10b).
4. The following data contradict Padgett's (1991) hypothesis. Padgett's proposal of an articulator group in which the manner features [consonantal] and [continuant] depend on place relies crucially on the assumption that in general nasals do not assimilate to fricatives. According to Padgett, if they do, this process should be postlexical and should result in a [+continuant] nasal. Zurich German is a counterexample to this thesis, because assimilation of a nasal to a following fricative applies both lexically and postlexically (*sämf* [sæmf] 'mustard' *Bahn fahren* [bɑːm fɑrən] 'to take a train').
5. Another process affecting consonantal quality should be mentioned here: contextual voicing makes a lenis stop voiced. It occurs between voiced segments, vowels, and consonants alike, and in every environment. This is an assimilation process that can be formally represented as spreading of the feature [voice] from adjacent segments. Examples appear in (14) and (15).
6. The clitic *si* 'she' attaches to the inflected verb.
7. It is again the contextual voicing process that turns the lenis stop [k] into a voiced stop [g].
8. This rule has exceptions: in Zurich German there is no palatalization of [s] in [sk] clusters, although some alemannic dialects have this palatalization (*Skelett/*Schkelett* 'skeleton'). There are also some loanwords that do not conform to the generalization: *slaalom* 'slalom'. Finally, palatalization is blocked if the cluster would be too "complicated" otherwise: *linguistisch* > *linguischtisch* 'linguistic'. In contrast, *linguischt* 'linguist' has a palatal.

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