



University of
Massachusetts
Amherst

On the Status of Structure Preservation in German

Item Type	article;article
Authors	Klein, Thomas B.
Download date	2025-05-19 08:23:42
Link to Item	https://hdl.handle.net/20.500.14394/36706

ON THE STATUS OF STRUCTURE PRESERVATION IN GERMAN¹

THOMAS B. KLEIN

UNIVERSITY OF DELAWARE

1. Introduction

Kiparsky 1985 has proposed the principle of Structure Preservation (SP):

Structure Preservation is the result of constraints formulated over the entire lexicon. [...] [I]f a certain feature is non-distinctive in a language we shall say that it may not be specified in the lexicon. This means that it may not figure in non-derived lexical items, nor be introduced by any lexical rule, and therefore may not play any role at all in the lexical phonology. (Kiparsky 1985: 87)

In recent work, Hall (1989, 1992) has argued that SP is violated by three processes in the phonology of Modern Standard German (MSG): the derivation of the velar nasal, the default rule for schwa, and the [ç]-[x] alternation. Hall, thus, argues that SP has to be weakened to a cross-linguistic tendency. In this paper, I will argue that if we apply a number of independently motivated tools and principles of autosegmental phonology and prosodic phonology, we arrive at advantageous reanalyses of the relevant data. Furthermore, I will show that there is no evidence from the three processes at hand

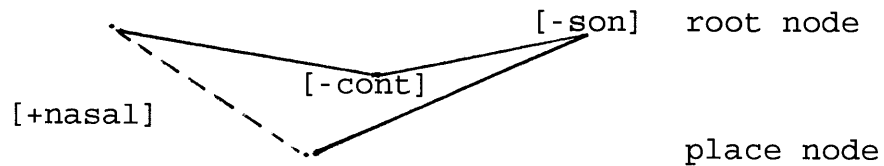
¹I am indebted to S.J. Hannahs, Bill Idsardi, Rolf Noyer, and Irene Vogel for insightful discussions of this research and to my informants, in particular Hans-Dieter Klein and Hans-Peter Ohl, for their patience. I bear full responsibility for any errors.

which forces us to weaken the universal principle of Structure Preservation.

2. The derivation of the German velar nasal

I will assume that the velar nasal is not an underlying segment in German without further discussion (cf. Issatschenko 1963, Vennemann 1970, and Hall 1992 for arguments). Hall 1992 has argued that all German underlyingly non-labial nasals are represented as /N/, a [+nasal] consonant underspecified for place features. Nasal Assimilation (NA) spreads the place node of an adjacent stop onto /N/:

- (1) Nasal Assimilation (NA) (domain: phonological word)



The application of (1) can be seen in (2):

- (2) a) /kRaNk/ ---> [kRaŋk] 'sick'
 b) /plUNp/ ---> [plUmp] 'awkward'

Assimilation does not apply lexically when the segment following /N/ is a fricative:

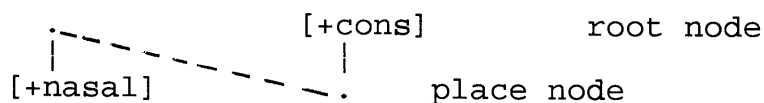
- (3) a) /zεNf/ ---> [zεnf] 'mustard'
 b) /mœNX/ ---> [mœnç] 'monk'

Because NA does not apply obligatorily across prefixes and compound constituents we can conclude that it applies within the phonological word (PW) as defined in Nespor and Vogel 1986 where prefixes and compound constituents form separate PWs:

- (4) a) [_{PW}Rεn][_{PW}ba:n] 'race track' c) [_{PW}Rεm][_{PW}ba:n]
 b) [_{PW}hIn][_{PW}ge:hðn] 'go to' d) [_{PW}hIŋ][_{PW}ge:hðn]

The rule deriving (4) c)-d) is formulated as follows:

- (5) Regressive Nasal Assimilation (optional) (Hall 1992)



This rule also applies optionally to the data in (3) a)-b), cf. (6):

- (6) a) [zɛnf] ---> [zɛŋf] 'mustard'
 b) [mœnç] ---> [mœŋç] 'monk'

Hall has followed the literature in assuming that the German velar nasal is derived from an underlying nasal + /g/ cluster even in morphemes where this /g/ never surfaces. /g/ is deleted by the rule of /g/-Deletion (/g/-D) after the application of NA:

- (7) /g/-Deletion (/g/-D)
 /g/ ---> Ø/ [+nasal]___].

- (8) Spreng-ung
 /špRɛŋg/
 cycle 1:
 NA: špRɛŋg
 /g/-D: špRɛŋ
 cycle 2:
 NA: špRɛŋ + Uŋg
 /g/-D: špRɛŋ + Uŋ
 ---> [špRɛ.ŋUŋ] 'explosion'

In (8), NA and /g/-D have applied cyclically (cf. Hall 1992). In Hall's system, *[špRɛŋ.gUŋ] would result if /g/-D applied postcyclically. Items like [taŋ.go] 'tango' show that /g/-D cannot be reformulated so as to delete /g/ syllable-initially. It is clear that NA must precede /g/-D; /g/-D applies cyclically which then means that NA applies cyclically as well. Thus, a violation of SP arises in Hall's system: the underlyingly non-distinctive velar nasal must be introduced lexically.²

A simple solution to this problem is available if we adopt an autosegmental analysis and see individual segments as being composed of independent units such as X-tier and melody tier.

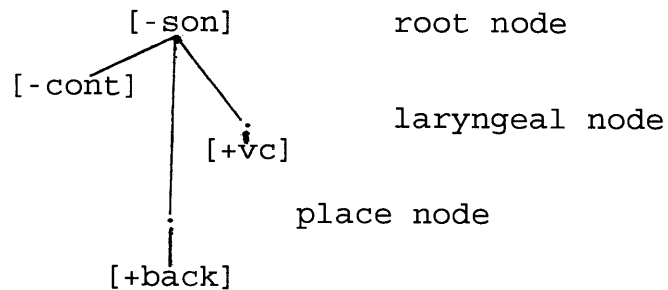
Kenstowicz and Rubach 1987 and Rubach and Booij 1990 have proposed to represent the vowels involved in the vowel/zero alternations of Slavic languages as vocalic melodies without an underlying X-slot. Two operations can then apply to such vowels. They surface after receiving an X-slot in certain environments or they are deleted via Stray Erasure (SE) (cf. Steriade 1982) if an X-slot is not provided. This proposal has been revised in Szpyra 1992 in that she argues for segments which are underlyingly

²Hall's analysis has at least one drawback: the /g/ in the /Ng/ cluster is an abstract segment in the sense that it never corresponds to an actual unit in the speech continuum. The language learner only has evidence for [-son], [-cont], [+voice], and [+back] with respect to the segment under discussion. Thus, the postulation of /g/ in the /Ng/ cluster entails the well-known problems for the learnability of abstract segments.

unspecified for [cons]. This proposal finds support in the present context in the sense that [+cons] is not a feature the language learner ever has evidence for with respect to /g/ in an /Ng/ cluster; our theory should therefore be able to express this in terms of underspecification.

I propose that the velar nasal in the native vocabulary of MSG derives from /NG/ where /G/ is the melody of a velar stop without an X-slot and [+cons]; note the representation in (9)³:

(9)



/G/ in (9) is invisible to syllabification (cf. Kenstowicz and Rubach, Rubach and Booij), but visible to NA. /G/ will not become prosodically licensed in the sense of Itô 1989 and is therefore subject to SE after NA has applied.

Evidence for the representation of /G/ as a voiced obstruent comes from the allomorphy in (10), originally observed in Vennemann 1970:

(10)	Voiceless obstruents	Sonorants
	Busch Ge-büsch-Ø 'bush'	Stuhl Ge-stühl-Ø 'chair'
	Trank Ge-tränk-Ø 'drink'	Wurm Ge-würm-Ø 'worm'
	Voiced Obstruents	/NG/
	Land Ge-länd-e 'area'	Hang Ge-häng-e 'slope'
	Haus Ge-häus-e 'hous-ing'	Ring Ge-ring-e 'ring'

(10) shows that -Ø appears as the suffixal part of the circumfix *Ge-[...]N-Ø/-e* if the root ends in a voiceless obstruent or in a sonorant; -e appears in all other cases. Interpreting [ŋ] as deriving from a nasal plus voiced obstruent cluster can explain why [ŋ] patterns with voiced obstruents in (10).

³(9) and similar representations below are given in the framework of McCarthy 1988.

The derivation of *Sprengung* 'explosion' proceeds as in (11):

(11)	$/\check{s}pR\varepsilon NG/$	+	$/UNG/$
lexical:			
	O NC		NC
	/ \		
syll.	$\check{s}pR\varepsilon NG$		UNG
postlexical:			
	O NC		NC
	/ \		
NA	$\check{s}pR\varepsilon \eta G$		$U \eta G$
	O NC		NC
	/ \		
SE	$\check{s}pR\varepsilon \eta$		$U \eta$
$---> [\check{s}pR\varepsilon . \eta U \eta]$ 'explosion'			

Assuming (9) as the underlying representation of /G/ enables us to dispense with the rule of /g/-D posited in Hall 1992. The universal convention of SE which does not need to be postulated language-specifically deletes the melody of /G/ without particular stipulations. This has the following consequence with respect to SP. NA does not need to precede /g/-D since /g/-D does not exist under the present analysis. NA in (11) can therefore apply postlexically and SP is not violated because the underlyingly non-distinctive velar nasal is not introduced lexically.

As far as the distribution of /NG/ vs. /Ng/ is concerned, note the minimal pair in (12):

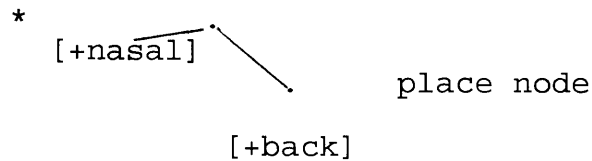
- (12) $[ga \eta \partial s]$ 'walk, gen sg' $[ga \eta g \partial s]$ 'Ganges'⁴

(12) shows that the distribution of /NG/ vs. /Ng/ must be stored in the lexicon in German.

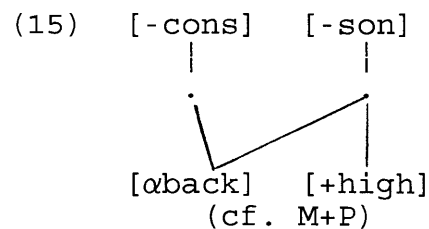
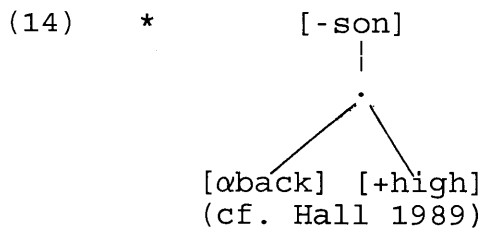
I force the postlexical application of NA through the following marking condition ruling out lexical velar nasals in German:

⁴Some speakers, including myself, have $[ga \eta g \varepsilon s]$ 'Ganges' as an alternative form. Other speakers only accept the data in (12).

(13)

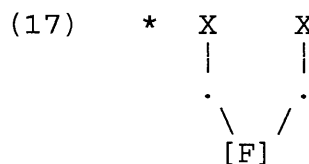
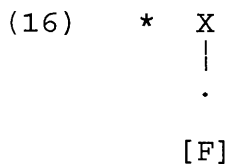


Note that in (13) [+back] is not associated with the place node. According to Hayes 1986, a bare autosegment such as [+back] in (13) is interpreted as linked to any number of autosegments under the Linking Constraint. The marking condition in (13), thus, says that [+back] cannot be linked to any [+nasal] element lexically. Representing [+back] without an association line to its place node in (13) solves the problem for marking conditions pointed out in MacFarland and Pierrehumbert 1991 (M+P). M+P observe that marking conditions of the form in (14) cannot prevent the derivation of assimilation structures as in (15):



The Linking Constraint requires a complete match between marking condition and derived representation. Such a match, however, does not obtain between (14) and (15) because [αback] in (15) is connected to two place nodes and not one as in (14). Therefore, marking conditions of the form (14) cannot prevent the derivation of assimilation structures of the form (15).

Marking conditions of the general form in (16) rule out assimilation structures such as (17):



(16) says that no autosegment dominated by X may be associated with a given feature [F]. Such a situation arises in (17) and is ruled out accordingly. (13) is a marking condition of the type in (16) and can therefore rule out a representation of the type in (17) which arises through the application of NA in German. Under SP, then, the German velar nasal is blocked from being derived lexically.⁵

⁵Furthermore, the representations in (9) and (13) only make reference to features the language learner actually has evidence for in the context of /NG/ clusters.

My analysis does not deny the role of overt /g/s for the derivation of the velar nasal in loanwords, cf., e.g. /taN.go/ ---> [taŋ.go] 'tango'.

To sum up, the analysis proposed here advocates a novel and less abstract representation of the velar stop in /NG/ clusters. NA can apply to this /G/ without violating SP. Thus, Hall's 1992 claim that the derivation of the German velar nasal violates SP is rejected.

2.1 Notes on /NG/ + *-ianer*

Rolf Noyer (p.c.) has pointed out the following datum:

- (18) a) Schering [ʃé:RIŋ] (name)
 b) Schering-ianer [ʃè:RIŋgiá:nðr] 'Schering supporter'

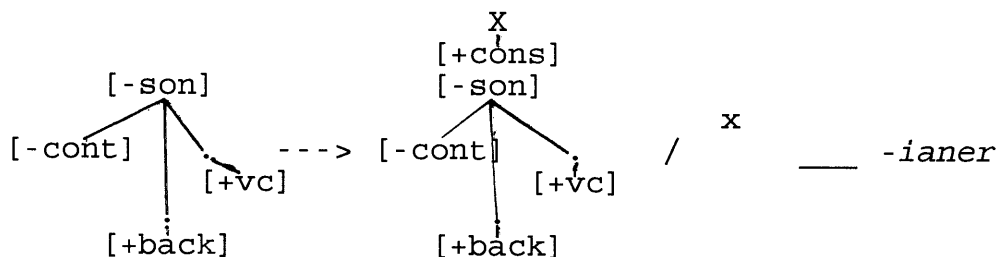
The appearance of [g] after [ŋ] in a word with a native root comes somewhat as a surprise to the analysis developed so far. Consider the additional data in (19):

- (19) a) Schering-ianer [ʃè:RIŋgiá:nðr]
 b) Wang [vaŋ] (name)
 c) Wang-ianer [vaŋgiá:nðr] 'Wang supporter'
 d) *[vaŋgiá:nðr]

(19) a) shows that [g] need not appear after [ŋ]. (19) b)-d) show that the optional appearance of [g] after [ŋ] is possible only after an unstressed nucleus.

The data in (18) and (19) can be handled through the following rule of /G/-licensing:

- (20) /G/-licensing (optional)

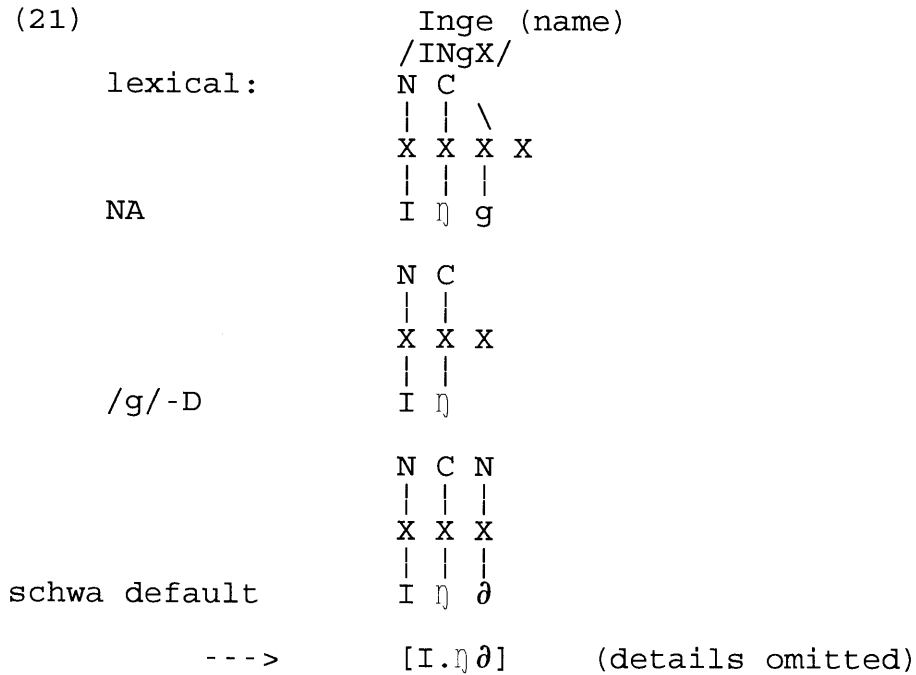


(20) says that /G/ is supplied with an X-slot and [+cons] and, thus, licensed as a [g] after an unstressed nucleus and before the suffix *-ianer*.⁶ It is clear that (20) must apply before SE and after the required metrical structure is available.

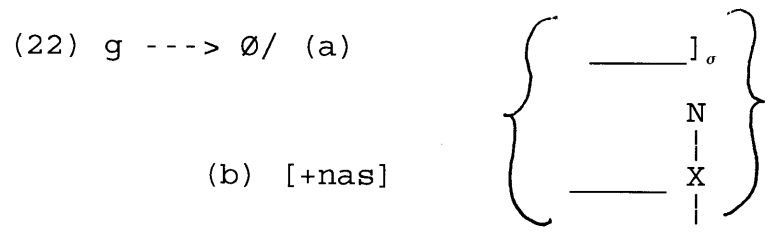
⁶I assume here that unstressed nuclei in German bear exactly one grid mark; cf. Klein 1992 for a more comprehensive treatment of German word stress.

3. The locus of schwa default in German

Hall 1992 has argued that German schwa default also violates SP. The following paragraphs will serve to summarize and reject this claim. Hall 1992 and Noske 1992 have argued that schwa must be represented underlyingly in some form in German for items such as [Iŋθ] which is derived in Hall's framework as in (21):



In Hall's system, NA and /g/-D must apply to /INGX/ in order to produce the correct surface form. Schwa in (21) must remain invisible to syllabification; otherwise two environments for /g/-D would be necessary; (22) a) (=7) for (8) and (22) b) for (21):



In order to avoid two environments for /g/-D and to make schwa invisible to cyclic syllabification, Hall proposes to represent schwa as an empty X-slot.

For cases such as (23), Hall claims that German schwa default must apply cyclically:

- (23) a) [lakìR+θRái] 'lacquering'
- b) /ze:gl/ -> [zè:gθl+ái] 'sailing'

The allomorphy in (23) shows that *-erei* attaches to a verbal stem ending in a stressed syllable whereas *-ei* attaches elsewhere.

- (24) Segel-ei
/ze:gl/
- cycle 1:
- X-insertion: X
 ze:g l
- schwa default: X
 |
 ze:gθl
- cycle 2: X
 |
 ze:gθl-aí
- > [zè:gθláí] 'sail-ing'

Under the assumption that schwa cannot bear stress, schwa default must apply on cycle 1 in (24) to make this information available before *-ei* can attach correctly on cycle 2. Thus, according to Hall 1992, SP is violated in German because schwa must be supplied its default features cyclically and, therefore, lexically.

I have argued above that /g/-D is all but superfluous in the grammar of German. Hall's argument that schwa must be represented as an empty X-slot in order to avoid two environments for /g/-D is therefore vacuous.

I follow Wiese 1986 and Noske 1992 in representing underlying schwa as an X-slot with a [-cons] specification. Even if we follow Hall to the extent that schwa must be inserted cyclically, the representation of schwa as an X-slot plus [-cons] allows for schwa default to apply postlexically. In this way, SP is not violated in German and a more natural locus of schwa default can be assumed:

- (25) Segel-ei
/ze:gl/
- lexical
cycle 1:
- X-insertion: X
 ze:g | l
 | |
 [-cons] [-cons]

cycle 2:

$$\begin{array}{c} \text{X} \\ \text{ze:g} \mid \text{l-aí} \\ \text{[-cons]} \end{array}$$

postlexical

schwa default: ze:gθl-ái

---> [zè:gθláí] 'sail-ing'

Under the assumption that an X-slot dominating only [-cons] and no other feature cannot bear stress, *-ei* can attach correctly in the morphology. Schwa default can now apply postlexically, and no violation of SP occurs.

Inge is now derived as in (26):

(26)

$$\begin{array}{c} \text{Inge} \\ \text{/ING X} \quad / \\ \mid \\ \text{[-cons]} \end{array}$$

postlexical:

$$\begin{array}{c} \text{X X} \quad \text{X} \\ \mid \mid \quad \mid \\ \text{I } \eta \text{ G} \quad \text{[-cons]} \end{array}$$

NA:

$$\begin{array}{c} \text{X X} \quad \text{X} \\ \mid \mid \quad \mid \\ \text{I } \eta \text{ G} \quad \theta \end{array}$$

schwa default:

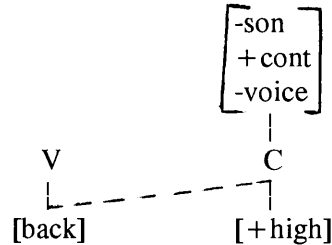
---> [I.ηθ]

This section has shown that, with /g/-D out of the way, German schwa can be represented as an X-slot plus [-cons] and schwa default can apply postlexically; consequently, no violation of SP occurs.

4. The [ç]-[x] alternation and the Phonological Word

Hall (1989, 1992, henceforth H) has proposed to derive German [ç] and [x] from /X/, a [+high] fricative underlyingly unspecified for [back]. A rule of Fricative Assimilation (FA) spreads the feature [back] from a preceding vowel to an immediately following [+high] fricative:

(27) Fricative Assimilation (FA) (domain: morpheme)
(Hall 1989:3)



[+high] fricatives unaffected by (27) are specified as [-back] by default. According to H, FA must apply tautomorphemically:

- (28) a) Kuh-chen /ku:Xn/ d) *[ku:xðn] 'cow, dim.'
 b) Kuchen /ku:Xn/ e) [ku:xðn] 'cake'
 c) Foto-chemie /fo:toXemi:/ f) *[fo:toxemi:] 'photo-chemistry'

FA must be blocked from applying in (28) a) and c); FA applies correctly in (28) b). H claims that the necessity of the tautomorphemicity requirement leads to a violation of SP in LP. Since [ç] and [x] are not underlying segments of MSG, SP would require FA to be a postlexical rule. This is not possible, however, because morphological structure is rendered invisible in LP through the lexical operation of Bracket Erasure (BE). Postlexically, BE yields the structures in (28) a) and c). Application of FA to these structures results in the ungrammatical (28) d) and f).

According to H, (28) is evidence that FA must apply lexically where morphemic structure has not yet been erased by BE. This then constitutes a violation of SP because the underlyingly non-distinctive [+back] vs. [-back] high fricatives must be derived lexically.

Noske 1990 has argued that the German diminutive suffix *-chen* is a phonological word by itself and derives several advantages from this for the analysis of [ç] vs. [x] which I will not repeat here. Nespor and Vogel 1986 have independently proposed that compound members always constitute separate PWs. If *-chen* and the members of German compounds are PWs, then the application of FA in data such as (28) could be restricted to the phonological word, in the same way as NA is (cf. above). As prosodic constituency is not subject to BE, FA could apply postlexically and SP would not be violated:

(29) Kuh-chen
/ku: /+ [_{PW}Xn]

lexical
PW-formation:⁷ [_{PW}ku:] [_{PW}Xn]

postlexical
FA: ---
default: [_{PW}ku:] [_{PW}çn]

---> [_{PW}ku:] [_{PW}çðn] 'cow, dim.'

Noske 1990 has claimed that *-chen* is a PW in all instances. Iverson and Salmons 1992 have argued that only non-umlaut-causing *-chen* constitutes a PW, whereas umlaut-causing *-chen* does not. These partially conflicting claims can be tested if we apply the diagnostic for PW-hood developed for Dutch and German in Booij 1985. Booij 1985 advances the following rule of coordination reduction in complex words:

(30) Coordination Reduction (optional)

- Delete Y. Conditions: (i) $Y = PW^m$ $m \geq \emptyset$
(ii) Y is adjacent to a conjunction
(iii) there is remnant that, like its counterpart, can function as focus constituent

According to (30), PWs can be deleted as shown in (31):

- (31) a) [_{PW}Foto][_{PW}~~chen~~ie] und [_{PW}Bio][_{PW}chemie] 'photochemistry and biochemistry'
b) * [_{PW}Foto][_{PW}chemie] und [_{PW}Bio][_{PW}~~chen~~ie]
c) * [_{PW}Foto][_{PW}chemie] und [_{PW}~~Bio~~][_{PW}chemie]

(30) has applied in (31) a); condition (ii) in (30) rules out (31) b) and condition (iii) rules out (31) c).

Iverson and Salmons's 1992 claim that umlaut-causing *-chen* is not a PW and that non-umlaut-causing *-chen* is a PW entails the following predictions with respect to Coordination Reduction. It should be possible to delete non-umlaut-causing *-chen*, but it should be ungrammatical to delete umlaut-causing *-chen*. Noske 1990 predicts no such difference; under her claim, it should be possible to delete *-chen* regardless of whether it causes umlaut or not. Note the following data:

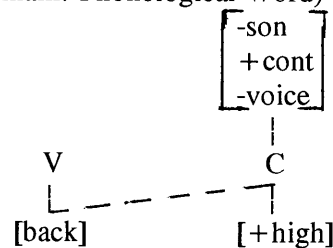
- (32) a) [_{PW}Schwester][_{PW}~~chen~~] und [_{PW}Brüder][_{PW}chen] 'sister and brother, dim.'
b) [_{PW}Hund][_{PW}~~chen~~] und [_{PW}Kätz][_{PW}chen] 'dog and cat, dim.'
c) [_{PW}Väter][_{PW}~~chen~~] und [_{PW}Mütter][_{PW}chen] 'father and mother, dim.'

⁷The status of PW-formation as a lexical operation has been argued for in Hannahs 1991.

(32) shows that *-chen* can be subject to Coordination Reduction. Furthermore, there is no difference between the umlaut-causing *-chen* in (32) c) and the non-umlaut-causing *-chen* in (32) b). Thus, the data in (32) confirm Noske's (1990) view that *-chen* is a PW regardless of whether or not it induces umlaut. Iverson and Salmons's 1992 view is not confirmed: there is no difference with respect to *-chen* causing umlaut or not.

In light of the data in (28) and (32), I reformulate FA as follows:

(33) Fricative Assimilation (FA) (domain: Phonological Word)



The postlexical application of (33) is determined through a marking condition parallel to (13); cf. (34):

(34) * $\begin{array}{ccc} & [-\text{son}] & \\ & | & \text{dorsal node} \\ \text{[+high]} & \text{---} & [\alpha\text{back}] \end{array}$

Note that $[\alpha\text{back}]$ in (34) is a bare autosegment.

Letting FA apply within the domain of the phonological word, a notion independently motivated for German nasal assimilation (cf. above) and Coordination Reduction, makes the postlexical application of FA possible (cf. (29) for a sample derivation). Thus, Hall's (1989, 1992) claim that FA violates SP can be rejected effectively. Furthermore, Hall's analysis is simplified in that his otherwise unmotivated tautomorphemicity requirement is replaced by independently needed reference to the phonological word.

5. Conclusion

I have proposed to derive the German velar nasal from /NG/. Under SE, this saves the rule of /g/-Deletion necessary in previous frameworks. The marking conditions necessary in Kiparsky's 1985 framework of Lexical Phonology have been reformulated so as to be able to rule out assimilation structures under the Linking Constraint. I hold the view that MSG schwa should be represented as an X-slot plus [-cons] underlyingly. Schwa default is shown to be able to apply postlexically. The status of *-chen* as a phonological word in German was confirmed empirically with data from coordination reduction. No difference was found there with respect to *-chen* causing umlaut or not. Both Nasal Assimilation and Fricative Assimilation are formulated with reference to the phonological word as their domain. This simplifies the grammar of German in that Hall's

(1989, 1992) tautomorphemicity requirement on the application of Fricative Assimilation is not needed.

This paper has shown that no evidence against SP can be derived from the MSG processes of velar nasal derivation, schwa default, or the [ç]-[x] alternation. Structure Preservation can be maintained as a universal principle by applying tools and principles already independently motivated in autosegmental and prosodic phonology.

- Booij, G. (1985): *Coordination Reduction in Complex Words: a Case for Prosodic Phonology*. in: Hulst, H. G. van der and N. Smith (eds.): **Advances in Nonlinear Phonology**. Foris: Dordrecht.
- Hall, T. (1989): *Lexical Phonology and the Distribution of German [ç] and [x]*. **Phonology** 6. 1-17.
- Hall, T. (1992): **Syllable Structure and Syllable-Related Processes in German**. Tübingen: Niemeyer.
- Hannahs, S. J. (1991): **Prosodic Structure and French Morphophonology**. Ph.D. diss., University of Delaware.
- Hayes, B. (1986): *Inalterability in CV Phonology*. **Language** 62. 321-351.
- Issatschenko, A. (1963): *Der phonologische Status des velaren Nasals im Deutschen*. **Zeitschrift für Phonetik, Sprachwissenschaft und Kommunikationsforschung** 16. 77-84.
- Itô, J. (1989): *A Prosodic Theory of Epenthesis*. **NLLT** 7. 217-260.
- Iverson, G. and J. Salmons (1992): *The Place of Structure Preservation in German Diminutive Formation*. **Phonology** 9: 137-143.
- Klein, T. B. (1992): *A Computation of German Word Stress*. ms., University of Delaware.
- MacFarland, T. and J. Pierrehumbert (1991): *On ich-Laut, ach-Laut and Structure Preservation*. **Phonology** 8. 171-180.
- McCarthy, J. (1988): *Feature Geometry and Dependency: a Review*. **Phonetica** 45. 84-104.
- Kenstowicz, M. and J. Rubach (1987): *The Phonology of Syllabic Nuclei in Slovak*. **Language** 63.3 463-497.
- Kiparsky, P. (1985): *Some Consequences of Lexical Phonology*. **Phonology Yearbook** 2. 85-138.
- Nespor, M. and I. Vogel (1986): **Prosodic Phonology**. Foris: Dordrecht.
- Noske, M. (1990): *Harmonic Phonology and the Distribution of Northern German [ç] and [x]*. **CLS** 26, vol.1. 333-348.
- Noske, R. (1992): **A Theory of Syllabification and Segmental Alternation**. Ph.D. diss., Catholic University Brabant.
- Rubach, J. and G. Booij (1990): *Edge of Constituent Effects in Polish*. **NLLT** 8. 427-463.
- Steriade, D. (1982): **Greek Prosodies and the Nature of Syllabification**. Ph.D. diss., MIT.
- Szpyra, J. (1992): *Ghost Segments in Nonlinear Phonology: Polish Yers*. **Language** 68.2: 277-313.
- Vennemann, T. (1970): *The German Velar Nasal. A Case for Abstract Phonology*.

Phonetica 22. 65-81.

Wiese, R. (1986): *Schwa and the Structure of Words in German*. **Linguistics** 24. 695-724.