

**COLOURFUL LEAGUES:  
A GOVERNMENT PHONOLOGY APPROACH TO  
FINAL OBSTRUENT DEVOICING IN GERMAN<sup>1</sup>**

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**Abstract**

The common phonological process which is traditionally known as 'final obstruent devoicing' is responsible for the fact that only voiceless obstruents (as opposed to voiced ones) are allowed to occur under certain conditions. This paper briefly points out some of the problems with SPE-type analyses of final obstruent devoicing and presents an alternative approach couched in the framework of Government Phonology. It argues that final obstruent devoicing is in fact the loss of the laryngeal element *L* from the segmental representation of an obstruent and that this is triggered by a following licensed domain-final empty nuclear position.

**1 Introduction**

It is hard to read any introductory text on phonology (Kaye 1989a, Kenstowicz and Kisseberth 1979, Schane 1973 and Lass 1984 are but a few examples of a large number) without coming across a phenomenon traditionally known as 'final obstruent devoicing' (henceforth FOD). This, such texts tell us, is one of the most common phonological events, shared by languages as diverse as 'Russian, Polish, Turkish, Catalan, Ojibwa (an American Indian language spoken in Ontario), and Wolof' (Kaye 1989a: 47). Much-cited, but, in my view, never analysed in as much detail as it merits, FOD is the topic of this paper.

What we find in German is this. Among other, exclusively voiceless, obstruents such as [ʃ] and [x/ç] German has five obstruents which occur both in their voiced and voiceless manifestations. These are [b/p], [d/t], [g/k], [v/f] and [z/s]. Examples of their contrastive distribution are given in (1). Square brackets indicate a broad transcription.

- |     |             |          |          |               |
|-----|-------------|----------|----------|---------------|
| (1) | 'robbery'   | [raubə]  | [raubə]  | 'caterpillar' |
|     | 'leagues'   | [bundə]  | [buntə]  | 'colourful'   |
|     | 'positions' | [la:gən] | [la:kən] | 'sheets'      |
|     | 'rampart'   | [val]    | [fal]    | 'case'        |
|     | 'to travel' | [raizən] | [raisən] | 'to tear'     |

What is remarkable about the above pairs of obstruents is the fact that only the voiceless member of the pair may occur in 'final' position. The effects of this restriction are set out in (2):

| (2) | Inflected form | Root/uninflected form | Gloss          |
|-----|----------------|-----------------------|----------------|
|     | [raubə]        | [raub]                | 'robbery'      |
|     | [bundə]        | [bunt]                | 'league'       |
|     | [ta:gə]        | [ta:k]                | 'day'          |
|     | [bra:və]       | [bra:f]               | 'well-behaved' |
|     | [raizə]        | [raɪs]                | '(I) travel'   |

The alternation is not restricted to *word-final* position, as witness the data set in (3):

| (3) | Orthography | No FOD   | FOD        | Gloss                  |
|-----|-------------|----------|------------|------------------------|
|     | Kalbe       | [kalbə]  |            | 'calf (dative)'        |
|     | kalblos     |          | [kalplo:s] | 'without a calf'       |
|     | Kinder      | [kɪndər] |            | 'children'             |
|     | kindlich    |          | [kɪntlɪç]  | 'child-like'           |
|     | bergig      | [bergɪç] |            | 'mountainous'          |
|     | bergarm     |          | [bɛrkʔarm] | 'lacking in mountains' |

## 2 The SPE approach

Among earlier attempts at getting to grips with the phenomenon of FOD, analyses couched in the SPE framework (see Chomsky and Halle 1968) are the most common (see, for example, Vennemann 1968, Kiparsky 1968, King 1969, Wurzel 1970, Lass 1971, Schane 1973 or Kenstowicz and Kisseberth 1979). Here I will briefly outline the problems associated with them.

Almost invariably, the feature-specifying re-write rule (4)

- (4)  $[-\text{son}] \rightarrow [-\text{voiced}] / \_\_\#$

is put forward, together with a small set of other rules and conventions which prevent this rule from applying before a vowel and in certain other cases (see Vennemann 1968: 161-185 and Brockhaus 1990).

There are basically two serious problems with this solution. Firstly, being rule based, it shares all the inadequacies inherent in a theory which depends on essentially arbitrary rules. Secondly, it fails to account for the data in a way which, as we shall see later, is highly revealing. Let me discuss these points in turn.

A relatively unconstrained theory such as SPE-type generative phonology usually has very little trouble in capturing a segmental (as opposed to a suprasegmental) process in a rule like (4). However, and I am by no means the first to point this out, it is unable to tell us why this *particular* process takes place, rather than a very different one. In the case of FOD, for example, the SPE framework could just as well have predicted that obstruents are all voiced (and not voiceless) before a #-boundary. Or, perhaps, that sonorants (not obstruents) must be voiceless

in this environment. This could be expressed just as easily as FOD, and yet, it never happens in any known natural language.

Readers who are familiar with *The Sound Pattern of English* may argue that markedness theory imposes at least some of the relevant constraints by making unnatural rules more costly. However, markedness theory is a kind of appendix which was attached to the theory in order, at least partly, to remedy this serious flaw. The fact remains that the main body of the theory is designed in such a way that it is impossible to show why the world has to be the way it is. In SPE phonology virtually anything goes, but in human languages only very few things actually happen.

The fact that the SPE approach fails to account for the data, i.e. falls short of descriptive adequacy, is my second point of criticism. Consider the data in (5). These are examples of cases where speakers of standard German, who otherwise use FOD identically, disagree in their pronunciations. Group A speakers systematically fail to devoice for these items (and others like them), while group B speakers have FOD here. B-type pronunciations are more common in the north of Germany and A-type in the south.

| (5)      | A          | B          |               |
|----------|------------|------------|---------------|
| Rodler   | [ro:dlər]  | [ro:tlər]  | 'tobogganist' |
| Siedler  | [zi:dlər]  | [zi:tlər]  | 'settler'     |
| Adler    | [ʔa:dlər]  | [ʔa:tlər]  | 'eagle'       |
| Handlung | [handlʊŋ]  | [hantlʊŋ]  | 'action'      |
| eignen   | [ʔa:ɣnən]  | [ʔa:knən]  | 'to suit'     |
| Lügner   | [ly:ɣnər]  | [ly:knər]  | 'liar'        |
| ebnen    | [ʔe:bnən]  | [ʔe:pnən]  | 'to level'    |
| Ordnung  | [ʔɔ:rdnʊŋ] | [ʔɔ:rtnʊŋ] | 'order'       |

Based on the observation that devoicing appears to occur in syllable-final position, SPE analyses claim that B-speakers insert a #-boundary (which is used as the SPE equivalent of a syllable boundary) after the affected obstruent to split up "unpronounceable" clusters' (Vennemann 1968: 183). This claim is rather dubious in itself (why are these clusters unpronounceable for B-speakers if A-speakers can manage them?), but it becomes wholly untenable when one considers the sort of syllables it requires A-speakers to have. Since only B-speakers have a syllable break between the two consonants in clusters such as [dl], [ɣn], [bn] and [dn] (recall that the difference in pronunciation between A- and B-speakers is attributed to a difference in syllable division), A-speakers must treat these as tautosyllabic clusters. This means that they are either syllabified in the rime or in the onset of a single syllable. The former possibility is highly unlikely, since more sonorous segments are normally closer to the syllable peak, besides which it is strongly counter-intuitive. The latter, on the other hand, may occasionally be entertained by native speakers (there is evidence for this from hyphenation errors). So, the SPE analysis makes it necessary for clusters such as [dl], [bn] or [dn] to be treated as syllable onsets.

If such onsets existed in German (and we shall see later that there are principled reasons why they do not exist universally), one would have to explain why they do not occur word-initially or, more generally, why they appear to be restricted to the very structures for which they were posited. To my knowledge, nobody has been able to provide independent evidence for the existence of such onsets. This suggests that there *are* no such onsets in German and that any analysis which crucially depends on them must be fundamentally flawed. So, the SPE solution fails to account for the facts as far as words like those in (5) are concerned.

I have singled out only two of the numerous problems with the SPE analysis, but I am convinced that the need for a better solution is sufficiently obvious already.

### 3 The Government Phonology approach

#### 3.1 Introduction

Government Phonology as developed by Kaye, Lowenstamm and Vergnaud (see Kaye, Lowenstamm & Vergnaud 1985 and Kaye, Lowenstamm & Vergnaud 1988, henceforth KLV 1985 and KLV 1988) is a theory which denies the existence of re-write rules and, instead, uses the principles and parameters approach familiar from syntax.

It assumes that, within a given domain, skeletal positions are not simply arranged adjacent to one another, but are bound together through government. Depending on, among other things, the governing properties of the segments occupying the positions involved, these positions enter into certain clearly-defined types of governing relations. Government Phonology also recognises empty skeletal positions, that is, skeletal positions which contain no segmental material. Their presence manifests itself, although they cannot be heard.

In what follows I shall try to show how one can gain a better understanding of FOD, using the tools available in Government Phonology. I will begin with a brief introduction to the governing relations provided for by the theory (section 3.2). In the next section (3.3), I will identify the segments involved in FOD and the syllable structures of typical FOD environments. This will be followed by a brief look at some principles of grammar (section 3.4) and an investigation of what triggers FOD (section 3.5). Section 3.6 will be devoted to an overview of the theory of segmental representations within Government Phonology, which will lead on to a discussion of the actual segmental changes FOD entails (section 3.7). The motivation for FOD in cognitive terms will be the topic of section 3.8, and my study of the phenomenon will be concluded by a re-evaluation of the term 'final obstruent devoicing' in the light of the findings (section 3.9).

Obviously, governing relations will play a very important role throughout this study, since - apart from a variety of other crucial functions - they constitute a kind of litmus-test, which enables us to see things which would otherwise remain invisible. A great deal of light can, for example, be shed on the internal structure of segments by examining the governing relations they are associated with. Therefore, I will begin with a very brief overview of governing relations in Government Phonology.

### 3.2 Governing relations in Government Phonology

Government Phonology recognises government at three levels, viz. constituent government (holding within a constituent), inter-constituent government (holding between skeletal positions in two contiguous constituents) and government by nuclear projection. Government at the first two levels is strictly local and strictly directional. In other words, positions which are in a governing relation must be adjacent (strict locality). Furthermore, government is universally defined as being left-headed for constituent government and right-headed for inter-constituent government (strict directionality). A direct result of these two principles is that constituents are maximally binary (see Kaye 1987 for the proof).

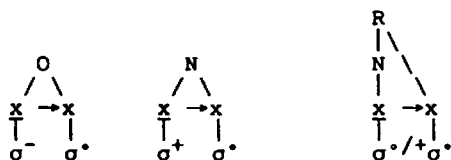
There are three syllabic constituents, viz. onset (O), nucleus (N) and rime (R). The nucleus is the head of the rime (left branch). The syllable, however, is not a constituent, for two reasons. Theory-internally, it would be anomalous in being the only right-headed constituent. Theory-externally, there is no conclusive evidence for the existence of such a constituent. All arguments in favour of the syllable can ultimately be reduced to arguments in favour of the kind of rime we find in Government Phonology, together with the concept of nuclear projection.

Each onset must be licensed by an immediately following nucleus and each nucleus must be preceded by an onset (although this need not necessarily have a skeletal point), so that a well-formed phonological representation consists of a set of O N sequences (these are, informally, referred to as 'syllables'). It follows from this principle that the right-most position in a domain is always a nucleus. A domain-boundary corresponds to an analytic morpheme boundary.

For governing relations to hold, the segments associated with the skeletal positions which enter into a governing relation have to fulfil certain charm or complexity requirements. The details of this will be discussed in the section on segmental representations (3.6), so suffice it to say at this stage that (positively or negatively) charmed as well as charmless segments can govern, while only charmless segments are potential governees. Positively charmed segments are only found in nuclear head positions, while negatively charmed segments are restricted to non-nuclear (head) positions. Charmed segments are 'strong' governors in the sense that they can govern simply by virtue of their charm, while charmless segments are 'weak' governors which can govern only if they are no less complex than their governees.

Constituent government, together with the most typical charm values, is illustrated in (6). The arrows indicate the direction of government. Heads are underlined.

(6)



(7) shows the most important cases of inter-constituent government.

(7)



Government at the level of nuclear projection is also local (but not strictly local), in the sense that, at the relevant level of projection, the two nuclear constituents concerned are adjacent, although other material may intervene at lower levels. Unlike constituent and inter-constituent government, government by nuclear projection is language-specific in its directionality. Directionality at this level of government is parametrically variable and is reflected in such prosodic phenomena as tone, stress, harmony and syncope.

Left- and right-headed government at the level of nuclear projection are illustrated in (8).

(8)



We can now address the question of what exactly the segments, syllable structures and governing relations relevant to FOD are.

### 3.3 The segments and syllable structures relevant to FOD

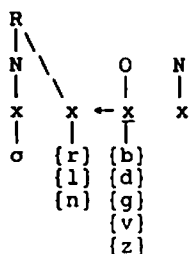
In (9) below we have a representative sample of words where FOD applies<sup>2</sup>, at least as far as the alternation cases are concerned. Distributional restrictions involving devoicing will have to be dealt with in a separate study. The orthographic representation of the root (which in all cases can occur in isolation) is given in the first column, followed by a broad transcription of it in the second. To avoid confusion with single square brackets (which indicate a broad transcription), double square brackets have been used for morphological structure. This usage will be maintained throughout. The third column shows, again in transcription, the behaviour of the same root with the non-analytic<sup>3</sup> suffix ɛ<sup>4</sup> added to it (in one case, which will be discussed in section 3.7, the final [ə] is actually part of the stem, and the form in the second column is colloquial, with an apocoped vowel). All items, then, consist of a single analytic domain. The formative boundary + is treated by the phonology as if it did not exist.

| (9) | Root |           | +Suffix     | Gloss         |
|-----|------|-----------|-------------|---------------|
|     | halb | { halp }  | { halb+ə }  | 'half'        |
|     | Wald | { valt }  | { vald+ə }  | 'forest'      |
|     | Balg | { balk }  | { balg+ə }  | 'brat'        |
|     | Hals | { hals }  | { halz+ə }  | 'neck'        |
|     | Korb | { kɔrp }  | { kɔrb+ə }  | 'basket'      |
|     | Bord | { bɔrt }  | { bɔrd+ə }  | 'shelf'       |
|     | Berg | { berk }  | { berg+ə }  | 'mountain'    |
|     | Kurv | { kurf }  | { kurvə }   | 'bend; curve' |
|     | Vers | { fers }  | { ferz+ə }  | 'stanza'      |
|     | Bund | { bunt }  | { bund+ə }  | 'league'      |
|     | Gans | { gans }  | { genz+ə }  | 'goose'       |
|     | Dieb | { di:p }  | { di:b+ə }  | 'thief'       |
|     | Rad  | { ra:t }  | { ra:d+ə }  | 'wheel'       |
|     | Tag  | { ta:k }  | { ta:g+ə }  | 'day'         |
|     | brav | { bra:f } | { bra:v+ə } | 'good'        |
|     | fies | { fi:s }  | { fi:z+ə }  | 'nasty'       |
|     | Haus | { haus }  | { hauz+ə }  | 'house'       |

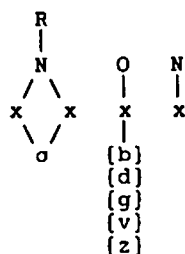
We can see that FOD occurs either after a long vowel (or a diphthong, which has the same syllable structure) or a branching rime. As far as FOD contexts are concerned, the governed position within the branching rime has to be filled by a coronal sonorant in German, ie. [r], [l] or [n]. This position is usually referred to as the rimal complement, but is also, informally, known as the 'coda' (recall that Government Phonology does not recognise a coda constituent). Moreover, a domain-boundary immediately follows an environment where FOD can take place.

The representation of a long vowel in German is a branching nucleus. So, we can show the syllable structures involved in FOD as in (10).

(10) (a) Branching rime



(b) Branching nucleus



We would then expect no governing relation to hold between the onset occupied by the FOD obstruent and the preceding nucleus in (10b). By contrast, this onset governs the preceding rimal complement (inter-constituent government) in (10a). The onset containing the FOD consonant in (10b) cannot be syllabified in any other way (say, in the rime) because constituents are maximally binary. If it were to be preceded by a short vowel, syllabification into the rime would still be ruled out by the Coda Licensing Principle (see section 3.4). Post-vocalic voiced/voiceless

What is particularly striking about (10) is that the right-most position in both representations is a domain-final empty nuclear position. Recall that every O must be followed by an N. Furthermore, the syllabification of a word-final consonant into the rime is ruled out by the Coda Licensing Principle (see section 3.4). *All* apparently word-final consonants, therefore, turn out to be followed by an empty nuclear position. The syllable structure of the German word **BUS** ([bus]; 'bus') would, accordingly, be that in (11a), while the structure in (11b) is ill-formed.

(b)



To be able to understand what the concept of licensing means, we need to introduce a few principles of grammar in Government Phonology.

The first principle of grammar relevant to my discussion of FOD is (12). It ensures that the last consonant in a domain is always syllabified in the onset, never in the coda (or post-nuclear rimal position). To put it differently, a coda is only allowed to be present, if it is followed by an onset.

Post-nuclear rimal positions must be licensed by a following onset. (Kaye 1989b: 12)

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(13) *The Empty Category Principle*

- i. A licensed empty nucleus has no phonetic realisation.
- ii. An empty nucleus is licensed if
  - (a) it is properly governed or
  - (b) if it is domain-final in languages which license domain-final empty nuclei. (Kaye 1989b: 16)

Another principle which will be familiar from syntax is the Projection Principle. The fact that Government Phonology, unlike a number of other phonological theories, does not allow resyllabification in the course of a derivation is due to this principle.

(14) *The Projection Principle*

Governing relations, once established, may not be modified in the course of a derivation. (KLV 1988)

The third principle of grammar relevant to my discussion of FOD is the Government/Licensing Constraint.

(15) *The Government/Licensing Constraint*

A properly governed nucleus may neither license nor properly govern itself. (Jonathan Kaye, personal communication)

The term 'licensing' does duty for several concepts. I will always try and make it clear how it is to be interpreted at each stage in the discussion.

In the sense of the ECP (see (13)), a licensed domain-final empty nucleus is thus a nuclear position which has no segmental content and which, by a parameter setting, has been licensed by the language to remain inaudible.

In the next section I will discuss the role licensed domain-final empty nuclear positions play in FOD.

### 3.5 What triggers FOD?

Both FOD contexts identified in (10) involve a licensed domain-final empty nuclear position ('final empty nucleus' for short). If it turns out that FOD applies if and only if the FOD consonant is immediately followed by a final empty nucleus, we may have solved the problem which the SPE analysis was unable to deal with. Our working hypothesis could be phrased as in (16).

- (16) FOD is triggered iff an FOD consonant is followed by a licensed domain-final empty nuclear position.

There is plenty of support for this hypothesis when we consider the morphological structure of some of the data listed earlier. In (17), morphological bracketing has been added to illustrate this point. At the end of each domain (when a double square bracket is closed), there will be a licensed final empty nucleus, which causes the obstruent to its left to devoice.

|           |                     |                        |
|-----------|---------------------|------------------------|
| (17) Raub | [ raup]             | 'robbery'              |
| Kind      | [ kint]             | 'child'                |
| kindlich  | [ [ kint] lɪç]      | 'child-like'           |
| Berg      | [ bɛrk]             | 'mountain'             |
| bergarm   | [ [ bɛrk] [ ʔarm] ] | 'lacking in mountains' |

This list could be extended *ad infinitum*. Similarly, (16) predicts that FOD will fail to apply where the FOD obstruent is followed by a nucleus which is not a licensed domain-final nucleus. This is the case in the non-analytic morphology, where suffixes are added so that the FOD consonant is no longer adjacent to a final empty nucleus. Consider the data in (18).

|           |            |                    |
|-----------|------------|--------------------|
| (18) Raub | [ raup]    | 'robbery'          |
| Raube     | [ raub+ə]  | 'robbery' (dative) |
| Kind      | [ kint]    | 'child'            |
| Kinder    | [ kind+ər] | 'children'         |
| Berg      | [ bɛrk]    | 'mountain'         |
| bergig    | [ bɛrg+ɪç] | 'mountainous'      |

So, it seems that both the analytic and the non-analytic morphology are well accounted for by (16). However, it is logically impossible to prove that a hypothesis is true. It can only reliably be falsified. To do this with (16), we need to look for cases where (a) FOD appears to be triggered in the absence of a final empty nucleus or (b) where a final empty nucleus fails to trigger it. I know of no cases of type (b). By contrast, cases of type (a) are readily available. In (5) we have several examples (repeated here - with morphological bracketing - as (19)).

| (19)     | A          | B          |               |
|----------|------------|------------|---------------|
| Rodler   | [ ro:dlər] | [ ro:tlər] | 'tobogganist' |
| Siedler  | [ zi:dlər] | [ zi:tlər] | 'settler'     |
| Adler    | [ ʔa:dlər] | [ ʔa:tlər] | 'eagle'       |
| Handlung | [ handlʊŋ] | [ hantlʊŋ] | 'action'      |
| eignen   | [ ʔaɪgnən] | [ ʔaɪknən] | 'to suit'     |
| Lügner   | [ ly:gnər] | [ ly:knər] | 'liar'        |
| ebnen    | [ ʔe:bnən] | [ ʔe:pnən] | 'to level'    |
| Ordnung  | [ ʔɔrdnʊŋ] | [ ʔɔrtnʊŋ] | 'order'       |

The morphology of all of these items is non-analytic<sup>4</sup>. The FOD consonants do not precede final empty nuclei anywhere. And yet, for B-speakers, FOD applies in every single item - apparently in conflict with our hypothesis.

The words in (19) are examples of 40 or so lexical items which behave differently from the remainder of the non-analytic morphology. This aberrant behaviour cannot be attributed to some special property that the suffixes *-er* (nominal agentive, as in *Rodler* or *Lügner*), *-en* (verbal, as in *eignen*) or *-ung* (nominal, as in *Handlung*) may have. This possibility is ruled out by the completely 'regular' behaviour of the vast majority of lexical items containing one

of these suffixes, where neither A- nor B-speakers can devolve. Examples of these are given in (20).

|      |             |           |           |               |
|------|-------------|-----------|-----------|---------------|
| (20) | <u>-er</u>  | Schreiber | [ʃraɪbər] | 'scribe'      |
|      | (nom.)      | Leser     | [leːzər]  | 'reader'      |
|      |             | Lader     | [laːdər]  | 'loader'      |
|      |             | Werber    | [vɛrbər]  | 'suitor'      |
|      | <u>-en</u>  | leben     | [leːbən]  | 'to live'     |
|      |             | bilden    | [bɪldən]  | 'to form'     |
|      |             | binden    | [bɪndən]  | 'to tie'      |
|      |             | grasen    | [graːzən] | 'to graze'    |
|      | <u>-ung</u> | Labung    | [laːbʊŋ]  | 'refreshment' |
|      |             | Waldung   | [valdʊŋ]  | 'woodland'    |
|      |             | Landung   | [landʊŋ]  | 'landing'     |
|      |             | Lösung    | [loːzʊŋ]  | 'password'    |

So what makes words like the ones in (19) so special? Let us take a closer look at the syllable structures involved in these problematic cases. Rodler ('tobogganist') is a good example. Its syllable structure is set out in (21).

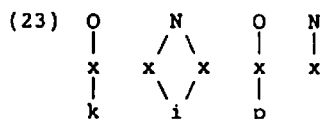
|      |   |       |     |   |   |   |   |   |
|------|---|-------|-----|---|---|---|---|---|
| (21) | O | N     | O   | N | O | N | O | N |
|      |   |       |     |   |   |   |   |   |
|      | x | x \ x | x   | x | x | x | x | x |
|      |   | \     |     |   |   |   |   |   |
|      | r | o     | d/t | l | ə | r |   |   |

There are two empty nuclei in this representation. One of them is domain-final and, therefore, nothing out of the ordinary, given that German parametrically licenses such positions. The other separates the FOD obstruent and the following lateral. Its presence may appear suspiciously convenient, considering that I am arguing that FOD is triggered by empty nuclei. However, Government Phonology requires this empty nuclear position to be there, for reasons which are completely independent of FOD and which will become clear when we consider two alternative representations ((22) and (26)), as well as the pronunciation of the citation form of the noun Rodel ('toboggan').

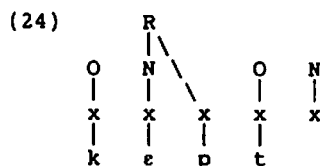
Firstly, the FOD consonant could be syllabified in the rime, with the lateral in the following onset. This would yield the structure in (22).

|      |   |   |     |   |   |   |   |
|------|---|---|-----|---|---|---|---|
| (22) |   | R |     |   |   |   |   |
|      |   |   |     |   |   |   |   |
|      | O | N |     | O | N | O | N |
|      |   |   |     |   |   |   |   |
|      | x | x | x   | x | x | x | x |
|      |   |   |     |   |   |   |   |
|      | r | ɔ | d/t | l | ə | r |   |

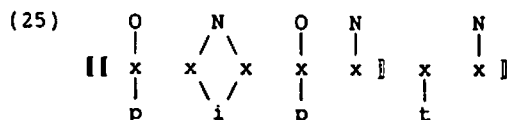
This configuration is ill-formed for two reasons. In the first place, it predicts vowel shortening. This is the same phenomenon that can be observed in alternations like keep ~ kept in English. In English, as in German, a long vowel is represented by a branching nucleus. Keep would then have the syllabic structure in (23).



Kept, on the other hand, the non-analytic past form of keep, which is stored as a separate lexical entry, requires the [t] to be syllabified in the final onset and the [p] in the preceding coda. This leaves only a single skeletal point for the vowel (recall that constituents are maximally binary). In other words, the theory correctly predicts that the vowel will shorten. This is shown in (24).



By contrast, verbs with a regular (analytic) past form, ie. the suffix -ed, exhibit no such vowel shortening effects due to their morphological structure. How this works is illustrated in (25), using peeped as an example and showing the state of affairs on the first cycle only.

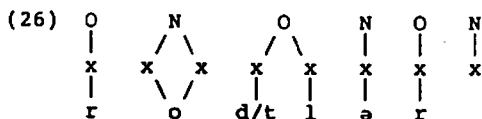


As we are treating items such as Rodler as having no internal morphological structure, a configuration similar to that in (25) would be ruled out, leaving the syllable structure in (22). It permits the first vowel to occupy only a single skeletal position, which means that vowel shortening has to take place, if (22) is correct. The pronunciation \*[rɒd/ɪlər], however, is not possible in either accent, A or B.

In the second place, there are difficulties concerning the inter-constituent governing relation which holds between the penultimate onset and the preceding rimal complement. (22) predicts that the skeletal position occupied by [ɪ] governs the one which is occupied by [d/t]. A sonorant, however, cannot normally govern a plosive. Coronal plosives are, as far as one can tell, completely ungovernable. The reasons why sonorants are much more likely than obstruents to occupy governed positions will be discussed in section 3.6. Suffice it to say at this stage that the fact that a particular skeletal position's ability to govern depends on - among other things - certain properties of the segment which occupies it accounts for very common asymmetries such as the existence of words like help in English, but the absence of \*hepl (where [p] and [ɪ] are adjacent). A word like helpline is no counterexample, as there is an empty nucleus separating the plosive and the following liquid. This becomes apparent when one considers the morphological

structure of **[ [ help ] [ line ] ]** (recall that the [p] in *help* and the [l] in *line* will be separated by a licensed domain-final empty nuclear position).

The second conceivable alternative to configuration (21) is shown in (26).



In this structure, the FOD plosive and the following lateral are syllabified into a branching onset, which, at least theoretically, is a possibility, since German (like English and French, but unlike Turkish and Arabic) is a language which licenses branching onsets. However, there are certain constraints on what can go into such a branching onset.

Among these constraints there appears to be one which prevents elements from spreading within an onset. This is put forward by KLV (1988: 28) as a stipulation which 'should be derivable from some more primitive theoretical notion'. At present, this is not possible, so, for the purposes of this paper we set aside the question of why this should be the case (it is likely to be an OCP effect). What I would like to propose here, however, is a tightening up of the constraint, which would make it possible to rule out unattested onsets such as [pm], [tn] or [tl], while leaving attested ones (eg. [tr]) intact. I would phrase it as in (27) below.

- (27) Segments within a branching onset may not share more than one element.

As we shall see later, [d/t] and [l] have exactly two elements in common, which is why they are excluded from forming a branching onset. Further evidence in support of the claim that [tl] and [tn] cannot constitute branching onsets and must be separated by a licensed empty nucleus comes from those accents of English which exhibit t-lenition before a licensed empty nucleus (such as London or Leeds, for example). In these accents, word-internal [tl] and [tn] sequences in words like *atlas* or *chutney* trigger t-lenition, which means that a licensed empty nucleus has to be present (see Harris 1989: 43 for details).

KLV (1988: 28) also discuss sequences of stops plus nasals, eg. [pn] as in *pneumatisch* ('pneumatic'). They observe that 'even these sequences are not branching onsets'. The following items may seem to constitute counterexamples to this claim:

|      |           |             |              |
|------|-----------|-------------|--------------|
| (28) | Knie      | [kni:]      | 'knee'       |
|      | Knoten    | [kno:tən]   | 'knot'       |
|      | Knute     | [knu:tə]    | 'knout'      |
|      | Gnom      | [ɡno:m]     | 'gnome'      |
|      | gnostisch | [ɡnɔstɪʃ]   | 'gnostic'    |
|      | Gneis     | [ɡnaɪs]     | 'gneiss'     |
|      | Pneumatik | [pnɔma:tɪk] | 'pneumatics' |

However, syllable structure is not available on inspection. The mere fact that [kn], [gn] or [pn] appear at the beginning of a word does not necessarily mean that there are no preceding or intervening skeletal positions, let alone that they constitute branching onsets. The myth that word-initial consonant clusters always form onsets is exploded in KLV 1988.

There is good evidence from a variety of sources (eg. Harris 1990) which suggests that heads tend to survive in processes where segments are detached from skeletal points or where skeletal points are lost. If [kn], [gn] and [pn] were indeed branching onsets, the plosive would be the head and one would expect the historical development from the common Germanic or Greek root to present day English to have resulted in forms such as [ki:] rather than [ni:], [gars] rather than [nars] or [pju:mætriks] rather than [nju:mætriks]. If, on the other hand, the two consonants are heterosyllabic, the nasal could be the head<sup>6</sup> and the English pronunciations would be what the theory predicts. Furthermore, as pointed out by KLV (1988: 28),

'English stress placement treats them as heterosyllabic (the stop closing the preceding syllable) although examples are not easy to come by: English aráchnoid, \*árachnoid.'

In other words, [kn], [gn] and [pn] are not onsets in German, or any other natural language. The same arguments hold for any other plosive+nasal sequence.

It is now clear that there are principled reasons why the purported onsets [d/tl], [g/kn], [b/pn] and [d/tn] could not, in fact, constitute onsets.

Furthermore, we have seen that syllable structures (22) and (26) are spurious and that the FOD plosive must be separated from the following sonorant by a nuclear position, as shown in (21).

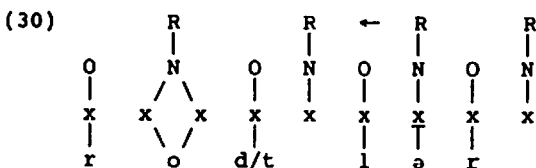
The fact that the citation form of the noun Rodel ('toboggan') is pronounced [rɔ:dəl], ie. with an unlicensed nucleus between the plosive and the lateral, lends further support to this analysis.

The nuclear position under discussion, however, is inaudible in all the words listed in (19) (and others like them), which, according to the ECP (see (13)), means that it must be either properly governed or domain-final. The latter could only be the case if B-speakers had carried out some unetymological reassignment of morphological structure. For example, [Rodler] might have been reanalysed as [[Rod]ler] or [eignen] as [[eig]nen]. Evidence for this morphological change could come from the newly created agentive suffix -ler (instead of -er) being used productively. To my knowledge, this is, however, not the case. Although, from the cognitive point of view, there may be arguments in favour of this analysis (see section 3.8), I feel that it is still not well enough supported (see also endnote 5).<sup>7</sup>

Instead, I would like to explore the possibility that both A- and B-speakers treat these items as non-analytic. The inaudible nuclear position would then have to be properly governed. Kaye (1989b: 14) defines proper government as follows.

- (29) A nuclear position  $\alpha$  properly governs a nuclear position  $\beta$  iff
1.  $\alpha$  is adjacent to  $\beta$  on its projection.
  2.  $\alpha$  is not itself licensed.
  3. No governing domain separates  $\alpha$  from  $\beta$ .

In German we find right-to-left proper government, so, if the proper governing relation is made visible, (21) will appear as in (30).



Can the penultimate nuclear position govern the antepenultimate in configurations like (30)? Are the three conditions on proper government relations met? Firstly, the two nuclear positions are adjacent at the relevant level of nuclear projection and, secondly, the governor is not itself licensed, as witness the fact that it always has phonetic content. Thirdly, there is no governing domain intervening between them. So, yes, the three conditions are met and we can conclude that a proper governing relation holds between the two nuclei.

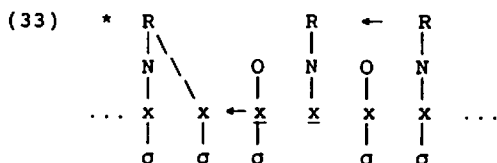
It is now possible to capture the difference between A- and B-speaker pronunciations in a condition which would be parasitic on the parameter which is responsible for the licensing of domain-final empty nuclear positions. The condition could look something like (31).

- (31) Only *domain-final* licensed empty nuclear positions trigger FOD. A: YES; B: NO

- (32) FOD is triggered iff an FOD consonant immediately precedes a licensed empty nuclear position.

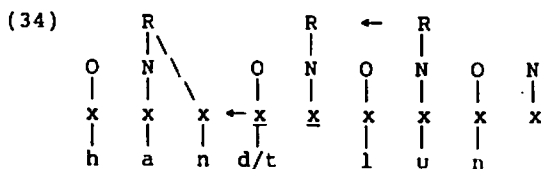
Together with another, more general, condition such as (32), condition (31) would account for all the data, while being fully compatible with the highly constrained theory of syllable structure contained in Government Phonology.

This analysis makes one prediction which can be put to the test quite easily. According to the Government/Licensing Constraint (see (15)) a properly governed nucleus may not license. More specifically, such a nucleus is unable to license (= empower) 'its' onset (i.e. the onset which immediately precedes it) to govern another position, e.g. a preceding rimal complement. According to Charette (personal communication), the nucleus is unable to 'government-license' its onset. In other words, we should never find a configuration such as (33), where a properly governed nucleus is required to government-license its onset.

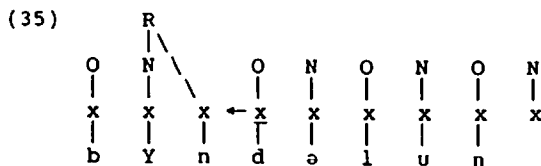


We would expect either the nucleus to receive phonetic content (ie. to behave as though it were unlicensed itself and thus turn into a licenser) or the governing domain to be broken up in some way. The former solution is chosen by, for example, French, Turkish and the Kaltungo dialect of Tangale, the latter by the Billiri dialect of Tangale and Korean. Thus, the same word, [landa+zi] ('your (fem) dress'), is pronounced [landuzi] in the Kaltungo dialect and [lanzi] in the Billiri dialect of Tangale (see Charette 1988: 214). In [landuzi] the properly governed (penultimate) nucleus is given phonetic content, which enables it to government-license its onset. In [lanzi], on the other hand, the governing domain is broken up. The potentially governing onset ([d]) loses its skeletal position and the properly governed nucleus can remain without phonetic content, because it is not required to government-license its onset.

Are there any cases like (33) in German and, if so, how does the language deal with them? Handlung (see (19)) is indeed such a case. Its syllable structure is set out in (34).



This appears to be the very configuration the Government/Licensing Constraint was designed to rule out. However, the stem handel- (together with schwindel- 'to fib', pendel- 'to swing, commute' and - of a slightly different type - orden- 'to arrange') is one of only four or five items which behave in this way<sup>8</sup>. The vast majority of structurally similar words (well over 50), exhibit the same solution to the government-licensing problem as French, Turkish and the Kaltungo dialect of Tangale. The properly governed empty nucleus receives phonetic content. An example of this is given in (35).



In Bündelung ('bunching') - and a considerable number of other items like it - the antepenultimate nuclear position *always* has to be phonetically realised so that it

can government-license its onset. This, incidentally, is reflected in the spelling. A filled nucleus does not trigger FOD, which is why both A- and B-speakers never devolve in these cases.

### 3.6 Segmental representations in Government Phonology

Let us now turn to the question of what exactly happens when FOD applies. In what way do the segmental representations of the affected segments change? Before we can answer this question, we need to say a few words about the theory of segmental representations within Government Phonology (see KLV 1985, KLV 1988 and Harris 1989 for details).

Unlike most phonological theories, Government Phonology is not based on features, but on elements. All segments are either elements themselves or consist of a combination of elements. Each element is a fully specified feature matrix, which means that elements are pronounceable at any stage in the derivation, by themselves or in combination with others.

Elements are assigned one of three charm values (indicated by the superscripts +, - and ° respectively), viz. positive, negative or neutral (charmless). They can combine with one another to form complex segments, whereby the charm values of the elements concerned impose certain restrictions on which elements can combine with which.

The combination of elements is carried out through fusion operations, each of which involves pairs of elements, with one being defined as the head and the other as the operator. Elements have a single salient or marked property. It is this property which is contributed by the operator in the process of fusion, while everything else (including the charm value) is normally taken from the head.

The only element which does not have a salient property is the so-called 'cold' vowel  $v^{\circ}$ . The implication of this is that fusion with the cold vowel in the operator role results in no change to the head at all. The presence of the cold vowel only manifests itself when it is the head.

Those elements which are relevant to the present discussion of FOD, together with their charm values, their phonetic realisations<sup>9</sup> as well as their salient and unmarked properties, are listed in (36) below.

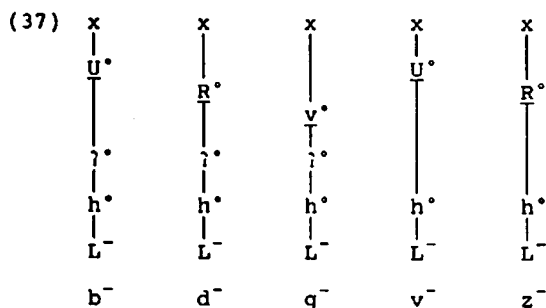
| (36) |                        | <b>Salient property</b> | <b>Unmarked properties</b>     |
|------|------------------------|-------------------------|--------------------------------|
|      | $U^{\circ}$ [u]        | labial                  | back, high, lax ...            |
|      | $R^{\circ}$ [ɾ]        | coronal                 | tap, ...                       |
|      | $I^{\circ}$ [ɪ]        | palatal                 | nonlabial, high, lax ...       |
|      | $v^{\circ}$ [ɪ]        | none                    | nonlabial, back, high, lax ... |
|      | $h^{\circ}$ [h]        | narrowed                | glottal, ...                   |
|      | $\text{?}^{\circ}$ [ʔ] | occluded                | glottal, ...                   |
|      | $N^{+}$ [n]            | nasal                   | nonlabial, approximant ...     |
|      | $L^{-}$ L              | slack vocal folds       |                                |
|      | $H^{-}$ H              | stiff vocal folds       |                                |

The element  $h^\circ$  is defined as specifying a narrowing in the vocal tract which results in turbulent airflow, that is, noise in the signal. As such it is obviously found in the representation of fricatives, but it also forms part of the representation of other obstruents, such as plosives. Unique to stops (both oral and nasal) is the element  $\gamma^\circ$ , which indicates the presence of occlusion in the vocal tract, which is reflected by a drop in amplitude in the signal. The nasal element  $N^+$  refers to a lowering of the velum and is found both in nasal stops and nasalised vowels.

The two elements relating to laryngeal activity,  $L^-$  and  $H^-$ , become apparent through a change in the fundamental frequency in the signal.  $L^-$  represents a drop and  $H^-$  a rise. In articulatory terms,  $L^-$  denotes slack vocal folds and  $H^-$  stiff vocal folds. When associated with a nuclear position, they are consequently interpreted as a low or high tone respectively. For non-nuclear positions, the presence of  $L^-$  is often treated as full voicing, while  $H^-$  indicates voicelessness. It appears that they, exceptionally, contribute their (negative) charm to an expression, even when they are operators. The absence of either  $L^-$  or  $H^-$  is to be interpreted as the absence of an active laryngeal gesture (as in a neutral segment).

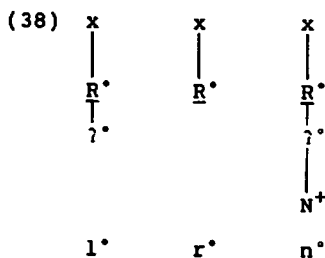
Elements are arranged on autosegmental lines in such a way that each element occupies its own line (labelled according to the hot feature of the element)<sup>10</sup>. Phonological representations consist of a two-dimensional grid where autosegmental lines and segmental positions intersect.

The five obstruents which undergo FOD in German would then be represented as shown in (37). Heads are underlined. Recall that an operator (with the exception of  $L^-$  and  $H^-$ , which contribute their charm even when operators) contributes only its salient property to an expression, while all other properties of a segment are those of the head.



Purely for greater ease of reading, I use informal notation, involving phonetic symbols with superscript charm values, as shorthand for full segmental representations. In this notation  $b^-$ ,  $d^-$  etc. refer to a fully voiced (lenis) segment,  $p^+$ ,  $t^+$  etc. to a voiceless (fortis) segment and  $p^\circ$ ,  $t^\circ$  etc. to a neutral segment. So, the representations in (37) show the fully voiced series (characterised by slack vocal folds). For the voiceless series ( $p^+$   $t^+$   $k^+$   $f^+$   $s^+$ ),  $H^-$  would occupy the bottom line instead of  $L^-$ , while the neutral series ( $p^\circ$   $t^\circ$   $k^\circ$   $f^\circ$   $s^\circ$ ), with no active laryngeal gesture, would have empty intersections at this point.

The segmental representations of the three coronal sonorants which can precede FOD consonants in FOD environments are set out in (38).



### 3.7 What are the changes involved in FOD?

This may seem a slightly odd question, given that FOD is known as just that - final obstruent *devoicing*. However, as we saw in section 3.6, there is no concept which corresponds directly to the traditional term 'voicing' in Government Phonology. We can only make reference to tones. So, what is it that changes when FOD applies?

Being a highly constrained theory, Government Phonology recognises only two types of phonological process, composition and decomposition. Either an element is added to a phonological representation through spreading from a neighbouring segment or an element is lost from the internal representation of a segment.

The composition analysis of FOD would involve spreading  $H^+$  onto a voiced segment to make it voiceless, whereas the decomposition analysis would involve the loss of  $L^-$ , which would result in a voiced segment losing its voicing. Let me discuss the two options in turn.

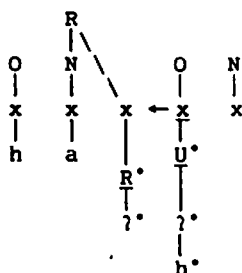
For the decomposition analysis to make sense, one would expect at least two conditions to be met. Firstly, there would have to be a local source for the element  $H^+$  and, secondly, the affected segment should be in an environment where it needs to be strengthened (adding an element strengthens the segment in the sense of the Complexity Condition). In other words, the strengthened segment should have governing work to do, as this is what motivates strengthening processes. In fact, neither of the two conditions appears to be met. Invariably, there is no local source for the laryngeal element  $H^+$  available in FOD environments. It is also clear from the data that FOD frequently occurs in configurations where the affected obstruent is not governing at all. This, for example, is the case in words where it is preceded by a long vowel or a diphthong. It appears then that there is no evidence to support the composition analysis of FOD.

The lenition analysis, on the other hand, is much better supported. All one would have to say is that the voiced alternant contains  $L^-$  in its lexical representation, which would mean that no local source for a laryngeal element is required. FOD could then be interpreted as the loss of this  $L^-$ . The implication of this would be that the voiceless alternant is neutral (i.e. lacking a laryngeal element) rather than truly voiceless (i.e. containing  $H^+$ ). Let us see whether this assumption is compatible with the data.

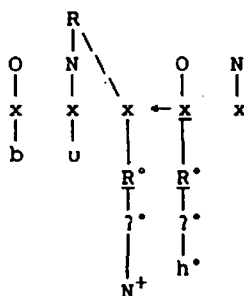
For this purpose we need to consider configurations where a governing relation is known to hold between the FOD consonant and some other segment (strictly speaking, the skeletal positions they are attached to). It is in such configurations

that charm values and segmental complexity are crucial. Consider, for example, the items halp and Bund, both of which exhibit FOD (see (9) for details). Their phonological representations (after the application of FOD) are shown in (39). To keep things as simple as possible, I have given complete segmental representations only for the segments which are immediately relevant to our discussion. The remainder are in broad transcription.

(39) (a) [halp]



(b) [bunt]



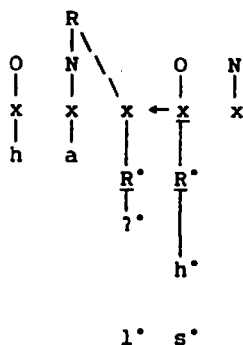
Before the application of FOD (i.e. loss of  $L^*$ ), the governing obstruent is negatively charmed and, therefore, a strong governor (recall that charmed segments can govern by virtue of having charm). Afterwards, however, it has lost its charm (through the loss of  $L^*$ , as shown in (39)) and can only govern by virtue of its complexity relative to that of the governee. Government involving neutrally charmed governors is constrained by the Complexity Condition (as originally put forward in KLV 1988: 37). Harris's (1989: 22) formulation of the condition is as follows:

(40) *Complexity Condition*

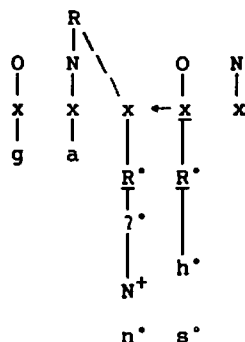
A neutrally charmed segment may occupy a governing position iff it is no less complex than its governee.

My interpretation of FOD as the loss of  $L^*$  thus causes no governing problems, at least not for plosives, which are relatively complex. Fricatives, on the other hand, lack the occlusion element  $?$  and difficulties may well arise. Consider the representations of Hals and Gans (see (9) for details).

(41) (a) [hals]

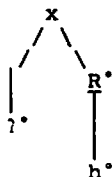


(b) [gans]



Hals causes no problems, as  $1^\circ$  and  $s^\circ$  are equally complex, whereas Gans appears to be in conflict with the Complexity Condition. The nasal  $n^\circ$  is obviously more complex than  $s^\circ$ . Words of this type are quite rare. A machine-readable dictionary of 115,000 words came up with only six, three of which were of Latin origin. Still, we would like to know how German deals with them. As there is no evidence to suggest that the syllable structures in (41) are in some way incorrect, we would expect something to happen. Indeed, something does happen. More often than not, Gans, for example, is pronounced [gants] rather than [gans] (this phenomenon is also attested in English words such as prince). In my view, this suggests that the governor is being strengthened through a spreading process which attaches the occlusion element  $?^\circ$  (from the  $n^\circ$ ) to the skeletal point occupied by the governor. Processes such as spreading tend to follow government lines (but not necessarily the direction of government). So, this particular case of spreading is exactly what we would expect. It results in the formation of a contour segment [ts], as shown in (42). There is independent phonological motivation for the existence of this contour segment, as it is, in fact, quite common in German. It represents the pronunciation of orthographic *z*.

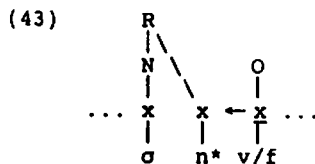
(42)



The contour segment contains three elements and is now as complex as the governor. There is no conflict with the Complexity Condition.

This analysis makes the following prediction for the only remaining FOD obstruent, the labio-dental fricative [v/f]. Either there are no cases where this segment occupies a governing position with the governee being more complex than  $1^\circ$  or spreading will take place in order to strengthen the governing  $1^\circ$ .

Unlike strengthened  $s^o$  (ie. [ts]), a phonologically strengthened labio-dental fricative is not attested in German and, consequently, it comes as no surprise that the language opts for the former solution. There are no German words involving the inter-constituent governing relation set out in (43).



The  $n^*$  in (43) stands for any nasal segment, regardless of its place of articulation. German does not exhibit this configuration, as spreading does not occur, and the fricative would not be able to govern the nasal without being strengthened.

By contrast, it would be possible for  $r^o$  or  $l^o$  to occupy the governed position in structures such as (43), since both are less complex than a nasal. There are, in fact, a small number of Romance loan words with a liquid in the coda and the potential of FOD occurring. They are listed in (44) below.

|      |          |             |                  |
|------|----------|-------------|------------------|
| (44) | Malve    | [malvə]     | 'mallow'         |
|      | Salve    | [zavə]      | 'volley; round'  |
|      | Reserve  | [rɛ'zervə]  | 'reserve'        |
|      | Konserve | [kɔn'zervə] | 'preserved food' |
|      | Kurve    | [kurvə]     | 'bend; curve'    |

Although theoretically FOD can apply in all of them and speakers can be 'made' to do this through spellings such as Malv, which suggest an informal pronunciation with an apocopated final schwa (a common phenomenon in German), there is a certain degree of resistance to this and, intriguingly, these items, with one exception, have been assigned a morphology which avoids the application of FOD. The one exception is a single item which has been incorporated into German morphology in such a way that FOD applies in several of its inflected forms. Our analysis makes the prediction that this exception will involve a configuration where government is made easier through the governee being the least complex segment possible. This is precisely what we find. The exception is the verb derived from Kurve. Unlike the other verbs derived from the nouns in (44), kurven ('to drive round') has the inflectional suffixes attached directly to the stem, like indigenous German verbs (while the others have another intervening suffix -ig, which obviates FOD). This entails the application of FOD. It occurs, for example, in the common colloquial 1st sg. present indicative form [kʊrf] (kurv: 'I drive round'), which alternates with the rare stilled form [kurvə] (kurve).

It appears that the lenition analysis of the event of FOD (ie. as loss of  $L^*$ ) is fully compatible with the data. In fact, it makes some interesting predictions which can serve to explain certain phenomena (such as the absence of particular clusters) which would otherwise have remained a mystery.

Further support for this analysis is provided by the fact that FOD behaves very much like another well-known lenition process, namely t-lenition in English. In fact, it applies under exactly the same circumstances as t-glottalling in Leeds and it parallels a considerable proportion of the t-leniting patterns of other English accents (see Harris 1989 for details).

From this I would like to conclude that FOD is indeed a lenition process involving the loss of L'.

A particularly remarkable 'side-effect' of this analysis is that the reason why only certain obstruents are affected is suddenly obvious. A rule-based approach, for example, could give no answer to the question of why final *sonorants* fail to devoice. It would be at least as simple to express this process (sonorant devoicing) as the one which actually occurs (obstruent devoicing). And yet, sonorant devoicing is not attested<sup>11</sup>, at least not as a spontaneous phonological event like FOD. The Government Phonology analysis, on the other hand, predicts that only segments which contain L' in the first place can lose it. None of the sonorants do and neither do the non-alternating affricates and fricatives.

### 3.8 The motivation for FOD

Let us now address the question of why FOD should exist at all. What is the motivation for FOD?

Asking why FOD exists is basically like asking why phonological processes should take place at all. It has been argued that their purpose is to enhance the robustness of the human communicative system and to assist with parsing (see Kaye 1989a).

In my opinion the function of FOD is to signal the presence of a licensed domain-final empty nuclear position (and thus a domain-boundary) in order to increase the speed and accuracy with which parsing can take place. Like stress in French (on the domain-final syllable) or Hungarian (on the domain-initial syllable), FOD is a reliable indicator of where domain-boundaries are present in an utterance<sup>12</sup>. At this stage, this interpretation of the cognitive function of FOD amounts to little more than speculation, and further investigation of this area is clearly necessary. However, I would like to illustrate the view put forward here with an example.

Consider the two nouns *Handlungen* and *Handlungen*. One of them is the plural of *Handlung* (see (19)) and the other is the plural form of a nonce compound consisting of *Hand* ('hand') and *Lunge* ('lung'), meaning roughly 'pocket size artificial lungs'. For an A-speaker, they would have the pronunciations [handluŋən] and [hantluŋən] respectively. The difference in morphological structure between the non-analytic [Handlungen] and the (analytic) compound [[Hand][Lunge][n]] is immediately apparent, signalled by the difference in FOD behaviour.

Having discussed the most important aspects of FOD, we can now ask ourselves how appropriate the traditional term 'final obstruent devoicing' really is.

### 3.9 The term 'final obstruent devoicing' re-evaluated

As we have seen, FOD does not apply word-finally, morpheme-finally or syllable-finally, at least not in the strict sense. It applies before a licensed domain-final

empty nuclear position (and, for B-speakers, probably even before a licensed domain-internal licensed empty nucleus in a small number of cases). So, there is something final about it, but this does not refer to the position of the affected obstruent, but of the nucleus which follows it. This nucleus has to be *domain-final*. In other words, there is a certain degree of truth in the label 'final', although not in the sense that this has been traditionally understood.

'Obstruent devoicing', however, is a concept which cannot be maintained in the Government Phonology framework. 'Voice' is a property which is allegedly shared by vowels, sonorant consonants and voiced obstruents. In the SPE framework, these are considered to have the feature specification [+ voice] in common. Consequently, one would expect them also to share some physical property which would be apparent in the signal. Acoustically, voicing in obstruents shows up as a drop in the fundamental frequency  $F_0$ . Unless a vowel (or a sonorant consonant) has a low tone, no such drop, however, can be observed. So, from the purely physical point of view, 'voice' does not appear to refer to any unitary phenomenon.

Furthermore, if the concept 'voice' were meaningful phonologically, one would expect the natural class of voiced segments to manifest itself in some way. This, however, is not the case. On the contrary, voiced obstruents behave very differently from voiced sonorants and vowels, as witness the fact that they can 'devoice' in an FOD environment, whereas the latter cannot.

All these problems disappear as soon as we accept that this blanket view of voicing bears no relation to phenomena in the real world. We need to recognise that 'voicing' in a vowel or sonorant consonant is very different from 'voicing' in a voiced obstruent. In the former case we need to treat it as an inherent phonological property which is 'automatically' present and is not explicitly specified through any of the elements the vowel/sonorant contains. It is thus the unmarked case. By contrast, voicing in an obstruent is defined as the presence of  $L^-$ , which expresses the fact that this constitutes the marked case. Moreover, the differing phonological properties of voiced obstruents, as opposed to sonorants and vowels, fall out as a result of this analysis. All we need to say is that FOD is the loss of  $L^-$ . The event is then automatically restricted to all segments which contain  $L^-$ , that is, a certain subset of obstruents.

We can now conclude that the Government Phonology analysis of FOD suggests that 'final obstruent devoicing' is a definite misnomer, as there is really no need to refer to obstruents or devoicing.

#### 4 Conclusion

The analysis of FOD presented here is no more than a few first steps towards gaining an understanding of the phenomenon itself and of its implications for phonological theory. Many contentious issues had to be ignored, tricky problems glossed over and a number of questions left unanswered. More research is needed, especially on the properties of FOD in languages other than German.

Still, I hope that what I have had to say shows something of the interesting and surprising insights into phonology, and ultimately the human mind, which can

be gained by working with a highly constrained theory such as Government Phonology.

## Endnotes

1. I would like to thank John Harris for his comments on earlier drafts of this paper.

2. Marginal cases and lexical exceptions have been excluded, as, for reasons of space, they will not be discussed in this paper.

3. The suffixes *-s*, *-er*, *-ig*, *-ung* and *-en* are treated as non-analytic in this paper for the following reasons. Firstly, German requires onsets to have both a skeletal point and segmental content (either a locally available segment or glottal stop, which is the default value). As a result, derivations involving vowel-initial suffixes can be kept maximally simple only if these suffixes are treated as non-analytic. Secondly, adding a vowel-initial suffix to a stem tends to result in forms which are indistinguishable from unanalysable words, eg. *Laube* ('summer-house'), *Bruder* ('brother'), *richtig* ('right'), *Innung* ('guild') or *Besen* ('broom'). Thirdly, the small number of suffixes which affect stress assignment (an indication that they are non-analytic), such as *-isch* and *-ei*, are all vowel-initial. Finally, analytic suffixes, such as *-s* or *-lich*, are more productive than the above, which are restricted to established words and would never be the first choice for the inflection of unknown/new words.

4. Referring to the suffix *-s* is, of course, a considerable simplification of the facts, as there are a number of suffixes in German which all appear as *-s* in the spelling, eg. a dative singular suffix, a plural suffix, a 1st sg. verb suffix etc. For the purposes of this table, however, the differences between these suffixes are not relevant.

5. Reasons for treating these suffixes as non-analytic are given in endnote 3. Additional evidence in favour of non-analytic structures comes from the pronunciation of B-speakers, who create branching onsets wherever the opportunity arises. Words which resemble the items in (19) in every way apart from the segments in the plosive+sonorant cluster, such as *Segler* ([ze:glər; 'yachtsman']), are syllabified with the plosive+sonorant cluster in a branching onset. This syllabification requires two conditions to be fulfilled. Firstly, the resulting branching onsets must be possible onsets in German, which is the case. Secondly, the two members of the cluster must be within the same analytic domain, which can be true only if words such as those in (19) consist of a single domain, as German (unlike French) does not allow branching onsets to immediately precede a final empty nucleus.

6. The details of this would have to be investigated elsewhere, as it is not normally possible for a sonorant to govern a plosive. There is, however, evidence from languages such as Greek that [k] and [p] (but not [t]) break the asymmetry predicted by inter-constituent governing relations. They can be associated both with governors and governees. The governing position would be occupied by k'/p' and

the governor by  $k^{\circ}/p^{\circ}$ . Moreover, nasals are the most complex sonorants, which may well go some way towards explaining why they can be governors here.

7. There is evidence to suggest that, unlike words containing the agentive suffix under discussion here, adjectives with the comparative suffix of identical shape (ie. -er) have indeed undergone this unetymological reanalysis. This interpretation is prompted by the pronunciation [no:plər] of the adjective nobler ('more elegant'), which contains a potential branching onset. Further research, however, is required.

8. An investigation of why these items should exhibit such exceptional behaviour would be beyond the scope of the present paper. At this moment, it is not clear to me how their behaviour can be accommodated in the Government framework. However, there is the possibility that the properly governed empty nucleus does have phonetic content after all, although this does not appear to be a 'proper' vowel. Spreading could take place from the following onset into the nuclear position. This would require the onset position to be occupied by a sonorant (obstruents cannot spread into nuclei). Remarkably, this is the case for *all* the exceptional items, which lends further support to the spreading hypothesis.

9. For typographical reasons, [ɿ] represents an alveolar tap and [ɪ] a lax unrounded high central vowel.

10. Lines can be fused (parametrically variable) to prevent the elements occupying these lines from combining with one another and thus to account for the absence for certain types of segments, eg. of front rounded vowels in English (fusion of U<sup>o</sup>- and I<sup>o</sup>-lines). I will assume that the L<sup>o</sup>- and H<sup>o</sup>-lines are fused in German.

11. I am aware of research into 'sonorant devoicing in Russian' being conducted by Susan Barry at UCL (see Barry (1989)). However, as she observes, such devoicing occurs only when the sonorant is adjacent to an obstruent, which, more often than not, is voiceless. In my view, this suggests that sonorant devoicing is not a spontaneous phonological event like FOD, but a physiologically conditioned spreading process involving the noise element  $h^{\circ}$ . A similar process can be observed in branching onsets in English, such as [pl] or [tr], where the sonorant has traditionally been interpreted as voiceless.

According to Halle & Clements 1983 there is final sonorant devoicing in Angas with no obstruent adjacent to the affected sonorant. This appears to contradict my analysis, but my guess would be that things are not what they seem and that this process, on closer inspection, will turn out to be non-segmental.

12. For the moment I have no ready answer to the question of why, for B-speakers, FOD not only signals the presence of domain-*final* licensed empty nuclei, but also of domain-*internal* licensed empty nuclei. This may be another argument in favour of an analysis which claims that B-speakers assign a different morphological structure to items such as Rödler than A-speakers do. More research into this area is clearly necessary.

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