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Finnish Consonant Gradation

The most remarkable fact about
phonological phenomena is that they exist at all.
— Kaye (1989: 16)

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Chapter 1

Introduction

The aim of this thesis is to investigate and propose a new analysis for Consonant Gradation (henceforth: CG) in Finnish, alongside vowel harmony *the* predominant phonological phenomenon of the language. CG is a process at work throughout the whole language, causing paradigmatic alternations, and therefore of considerable importance. As my theoretical framework I will adopt Government Phonology (references to follow), whose aim it is to apply a Principles and Parameters approach (Chomsky 1981, 1995) to phonology.

CG has of course already been dealt with in a number of (traditional) analyses; within Government Phonology there is only one monograph in which Finnish CG is tackled (Gibb 1992). However, a re-analysis seems to be in order — even necessary — considering that the theory has recently gone through several changes in the mechanisms at its command. Earlier models of phonological structure have been abandoned in favour of an even more Spartan version. A radically simplified and restricted inventory of basic elements and processes is assumed to be responsible for all the phonological phenomena we find in the languages of the world. I will try to show what the consequences for Finnish are.

CG is particularly interesting in this respect, as it is usually seen as a closed-syllable phenomenon, *i.e.* the openness or closedness of the syllable seems to be the triggering factor in many cases. However, there are quite a number of forms which cannot be explained by this approach. By adopting Government Phonology, we will see how the radically simple make-up of the phonological skeleton and the relationships between skeletal points, which together replace the traditional concept of the syllable of other frameworks, allow us to make very precise predictions on the occurrence of CG.

In particular, I will elaborate on the ideas of Szigetvári (1999), who presents a very comprehensive and coherent theory of lenition (termed "Coda Mirror Plus") and provides all the necessary tools for phonological analysis. It is more than merely a further development of Ségéral & Scheer's (1999) Coda Mirror. We will

see how Szigetvári's model enables us to capture the alternations of which CG consists in a natural way.

This also entails another important aspect: Many analyses of Finnish attach great importance to the question of whether CG is a purely phonological phenomenon or whether and to what extent it has been morphologised. Gibb (1992) shows quite clearly that many "irregular" cases which are usually seen as a sign of morphologisation become perfectly well-behaved as soon as a more appropriate theory of phonology is adopted. Many (if not all) of the remaining problems can be satisfactorily explained by applying Kaye's (1995) minimalist model of the interaction of phonology and morphology. This gives me space to concentrate on the question of whether current versions of Government Phonology still provide the appropriate tools to analyse the phenomenon. CG is a suitable testing ground to see how far existing mechanisms of the theory can be exploited.

I do hope to give a conclusive account of the central phenomena of CG. However, of course, my analysis is by no means complete — a goal that seems hard to accomplish in a thesis of this length. CG is a complex phenomenon, and many of its mysteries will remain unsolved.

Data will exclusively be taken from modern Standard Finnish. I will not go into the historical development of CG. The main areas I am concerned with are the so-called "normal" and the "inverted" CG. The "special"[1] CG will not be tackled, which seems to be justified, as its application is mostly optional, and thus it is not as important as the other two. All these different kinds of gradation are instantiations of what is termed "radical" CG, *i.e.* it takes place in the root of a word but also — to make things more complicated — in suffixes. This is to be separated from "suffixal" CG which takes place *exclusively* in suffixes, follows different principles and allows only a subset of the alternations we encounter in radical CG. Since its workings are so different, we will not go into it here but rather concentrate on cases of radical CG.[2]

Throughout the text I will use (italicised) graphematic representations for Finnish forms. Such an approach seems sensible as Finnish orthography is nearly perfectly phonematic. Special formats of representation will only be made use of when necessary, in which case I will keep to the standard of enclosing phonetic transcriptions in square brackets ([ ]), phonological representations between slashes (/ /) and graphematic forms in angled brackets (⟨ ⟩). Moreover, capitals in orthographic forms denote archiphonemes whose realisation is determined by vowel harmony.

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[1] For the Finnish terms see Karlsson (1983), who gives *normaali astevaihtelu* 'normal grade alternation', *käänteinen astevaihtelu* 'inverted grade alternation' and *erikoisvaihtelu* 'special alternation', respectively.

[2] The separation into different kinds of gradation made here will be returned to later on.

This thesis is organised as follows: Chapter 2 gives a short introduction to the key concepts of Government Phonology, in order to familiarise the reader with this theory and to clarify aspects of the analysis to come. In chapter 3 a general overview of the sound structure of Finnish as well as the details of CG are presented. Chapter 4 reviews Gibb's (1992) analysis of CG and its consequences. Chapter 5 constitutes the core of this thesis: a thorough re-analysis of CG is presented. However, it concentrates on structural aspects of the phenomenon; issues of melody are tackled in chapter 6. Chapter 7 deals with the interaction of phonology and morphology in the workings of CG. A separate chapter (8) is dedicated to well known problems in CG. The results of the present thesis are summed up in English and in German in the chapters 9 and 10 respectively.

Chapter 2

Government Phonology:
the state of the art

2.1 Standard Government Phonology

Since its beginnings in the 1980's, **Government Phonology** (henceforth: GP) has gone a long way. Deriving phonological phenomena from universal principles and parameters has always been its main concern, thus trying to show that phonology is essentially parallel to syntax. The first papers to display such a conception of phonology were Kaye, Lowenstamm & Vergnaud (1985), Kaye, Lowenstamm & Vergnaud (1989) and Kaye (1990), yet GP also owes a great deal to other theoretical frameworks, such as Dependency Phonology (Anderson & Ewen 1987) and Particle Phonology (Schane 1984).
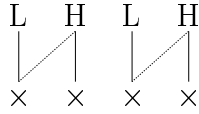
As Kaye, Lowenstamm & Vergnaud (1985: 305) stipulate,

(1)   phonology is to be regarded as a system of universal principles defining the class of human phonological systems. [. . .] A complete phonological system consists, then, of these principles along with sets of parameter values. [. . .] [A] phonological system contains no rule component. The observed phonological phenomena result from a combination of the general principles governing phonological representations and structures and the parameter values in operation in the particular language. [. . .] [A]n increasing number of phonological processes which were formerly considered to be manifestations of rules are now successfully derivable from the principles of Universal Phonology (UP).

GP is autosegmental, *i.e.* the various features (dubbed "elements") of the

phonological make-up of a segment reside on independent tiers. GP comprises a theory of both the internal structure of segments and suprasegmental organisation and interaction. These issues will soon be looked at more closely.

One of the basic principles underlying the theory is **non-arbitrariness**, *i.e.* there is a direct relationship between a phonological process and its environment. In order to give but a short example (taken from Kaye, Lowenstamm & Vergnaud 1989: 32), consider a process whereby a high tone following a low tone is turned into a rising tone. Such a process is non-arbitrary, as it is caused by the phonological environment. In an autosegmental framework like GP, this can be depicted in the representation in a straightforward way — a rising tone is simply the result of spreading of an autosegment. On the other hand, a characterisation of this process in terms of rules (as in earlier frameworks) does not meet this requirement of non-arbitrariness. Compare the two approaches in (2).

(2)   a.   L   H   L   H

           ×   ×   ×   ×

       b.   H → LH / L __
           *H → HL / L __
           *H → LH / __ L

An autosegmental representation as in (2a) not only explains why the process should take place, it actually *leads* us to expect that it take place. There would be no natural way to explain a process turning a high tone following a low tone into a falling tone. In other words, our format of representation is a means both to explain existing regularities and to exclude certain untestified processes. Markedness of processes is directly built in. On the other hand, a re-write rule mechanism does not make any such predictions. Any of the three rules in (2b) is statable with equal ease, yet they differ in plausibility. Untestified processes are not excluded by the rule format itself; instead, the rules capturing them have to be excluded separately.

2.1.1   The internal make-up of segments

The way GP conceives of segmental composition is quite different from mainstream phonology. While the latter considers segments to be composed of a (rather large) set of binary features, GP only allows for a small number of melodic primes ("elements"), which are unary (privative). In other words, instead of specifying whether a segment is [+round] or [−round], GP assumes that the segment

possesses the element U if and only if it is rounded. When dealing with an un-rounded segment, the element U is simply absent from the representation. It has to be noted, however, that an element cannot typically be equated with a single feature in orthodox feature theory, nor can the coefficient of traditional features (+ or −) simply be related to the presence or absence of an element in GP.

As Kaye, Lowenstamm & Vergnaud (1985: 306) put it, "[t]he primary unit of segment constitution is the ELEMENT, which is a *fully specified matrix*, pho-netically interpretable". In other words, Kaye, Lowenstamm & Vergnaud (1985) still attempt to relate the elements to a set of orthodox features and propose a translation from one system to the other. Later works abandoned this idea and elements have since been related directly to acoustic properties (Harris & Lindsey 1995) or they are even understood as yet more abstract entities (Jensen 1994). Both approaches thus lead to a phonological theory indifferent to the modalities of articulation or perception. However, for the sake of familiarity, a rough charac-terisation of elements in terms of articulatory properties is given in the following chart.[1] (Summary taken from Brockhaus 1995: 196.)

(3)

element	salient property
U°	labial
R°	coronal
I°	palatal
A^+	non-high
$ɨ^+$	ATR-ness
v°	(none)
h°	narrowed
$ʔ^\circ$	occluded
N^+	nasal
L^-	slack vocal folds
H^-	stiff vocal folds

(3) gives the inventory proposed in standard GP (*cf.* Kaye, Lowenstamm & Vergnaud 1985, 1989, Harris & Lindsey 1995).[2] The generative capacity of these 10 elements is more restrained than that of the ca. 20 traditional binary features (*e.g.* in Halle & Clements 1983). Segments can be made up of a single element (A^+ on its own would be realised as [a]) or of a combination of elements, in which case there is an asymmetric relationship beween the so-called head of the expression and the operator(s). A segment has to have a head, but is allowed to exist without

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[1] The meaning of the superscripts $^\circ$, $^+$ and $^-$ will be explained shortly.

[2] Several attempts have been made to decrease the number of elements and restrict the theory even further. We will return to this issue in 2.2.

any operators. Furthermore, one has to take into account whether a melodic expression is associated to a nuclear position or a non-nuclear position (on which more in 2.1.2). The case of glides is well known; the difference between [j] or [w] on the one hand and [i]/[ɪ] or [u]/[ʊ] on the other can be attributed to the position of the segment in the phonological string. Some examples of possible combinations and the effect of headedness are displayed in (4), where the rightmost element (underlined) is the head of the expression.

(4) a. $(A^+, \underline{I}°) \rightarrow [ɛ]$
     b. $(I°, \underline{A}^+) \rightarrow [æ]$

Note that (4) gives only approximate phonetic realisations; the difference could also be one of [e] vs. [ɛ], depending on the language under investigation.

The combinatorial possibilities are further reduced by the property of **charm**. Each element has a certain charm value; it can be positively charmed ($^+$), negatively charmed ($^-$) or charmless ($°$). Elements with like charm ($^+$ or $^-$) repel each other, whereas elements with opposite charm attract each other. Charmless (better: "neutral") elements can combine with any segment. In other words, a combination of H^- and L^- is ruled out (headedness does not matter in this case), while an expression such as $(H^-, h°, ʔ°, \underline{R}°)$ as the representation of a voiceless, aspirated alveolar stop is permitted.

The advantages of this approach to melody are obvious. Firstly, the number of possible combinations between these primitives is quite restricted as there is only a small set of elements to choose from. Additional refinements such as charm theory restrain the generative mechanism even further. Secondly, because the elements are privative, the internal structure of segments makes predictions about possible phonological processes. An element can only be present or absent, which entails that an absent element can never be the trigger of a process. Compare this to standard phonological practice, where both [+back] and [−back] could be the trigger of, say, a harmony process. To express frontness, GP uses the element I°. It can only trigger harmony (*i.e.* spread onto other nuclear positions) when it is present in the phonological representation. While mainstream phonology allows in principle for two processes (spreading of [+back] or [−back]), the theory of elements used in GP predicts that there could only be one process (spreading of I, *if* it is present). [3]

Elements are only posited when a segment has properties which involve special activity. Spontaneous voicing in sonorants does not count as such a property and

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[3] In fact, the issue is not that easy, as Harris & Lindsey (1995: 43) propose that harmony could also be the result of delinking. Other proponents of GP categorically reject delinking (*e.g.* Neubarth & Rennison in press and Rennison 1990).

thus does not have to be included in the representation (*cf.* Szigetvári 1999: 153). In other words, the informational richness of the acoustic signal is directly encoded in the format of representation (Harris 1999). This is in stark contrast to an analysis in terms of traditional binary features. Although it is true that some frameworks allow for a number of features to be filled in during the course of derivation, at the end (*i.e.* when it comes to mapping from phonology to categorical phonetics) all of them have to present. Every single segment possesses the same number of features, their respective complexity as regards the acoustic signal is not taken into account. As a consequence, lenition, which typically "manifests itself as an opening of consonantal stricture" (Harris 1994: 120), has to be stated as a set of re-write rules. In order to accomplish a lenition of [p] to [w], not only do we have to change [−continuant] to [+continuant] but we also have to make several subsequent adjustments ([+consonantal] → [−consonantal], [−sonorant] → [+sonorant], [−voice] → [+voice]). This seems to indicate that both the lenited and the unlenited consonant are equal in information. In contrast, the way GP understands melodic structure enables us to capture lenition phenomena in a much more straightforward way. Lenition can simply be accounted for as the loss of melodic material. Harris (1999: 179) points out that "[t]he reduction in elementary complexity [. . .] goes hand in hand with a reduction in signal complexity". As (5) illustrates, a lenited segment consists only of a subset of the elements its stronger counterpart possesses.[4]

(5)	aspirated labial plosive	(U, ʔ, h, H)	*e.g.*	[pʰ]
	fully labial plosive	(U, ʔ, h, L)	*e.g.*	[b]
	plain labial plosive	(U, ʔ, h)	*e.g.*	[p]
	unreleased labial plosive	(U, ʔ)	*e.g.*	[p̚]
	labial fricative	(U, h)	*e.g.*	[ɸ]
	labial approximant	(U)	*e.g.*	[w]
	glottal stop	(ʔ)	*e.g.*	[ʔ]
	glottal fricative	(h)	*e.g.*	[h]

This also allows us to account for lenition trajectories, *i.e.* the fact that there seem to be different paths lenition can follow. These trajectories are the result of different elements being lost. This is illustrated in (6) (adapted from Harris 1994: 120).

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[4] The chart is taken from Harris (1999: 178). Harris does not explicitly indicate headedness, but it is the regular practice to interpret the rightmost element as the head. Also, the charm values are not given, the reason for which will soon become clear.

(6) a.

process	segment	melodic composition	*e.g.*
	plosive	(U, h, ʔ)	[p]
spirantisation	fricative	(U, h)	[ɸ]
'aspiration'	h	(h)	[h]
deletion	∅	—	—

b.

process	segment	melodic composition	*e.g.*
	plosive	(U, h, ʔ)	[p]
glottalling	ʔ	(ʔ)	[ʔ]
deletion	∅	—	—

c.

process	segment	melodic composition	*e.g.*
	non-continuant	(U, h, ʔ)	[p]
vocalisation	resonant	(U)	[w]
deletion	∅	—	—

The autonomous status of elements also entails that there is no linguistically significant level of phonetics. The phonetic interpretation of an expression can be read off the phonological structure in a straightforward way. As Harris (1999: 167) puts it, "phonology maps directly to the quantitative values of articulation and auditory perception without having to pass through some intermediate categori[c]al level."

2.1.2 Interaction between segments

GP assumes that melodic expressions have to be associated to a skeleton in order to be phonetically interpreted. This skeleton is nothing but a tier of timing slots which allows for multi-dimensional associations to it. Except for being the anchorage for melody, the skeleton also projects syllabic constituents. Kaye, Lowenstamm & Vergnaud (1989) propose that there are three such syllabic constituents, onsets (O), rhymes (R) and nuclei (N), where the rhyme is in fact nothing but a projection of the nucleus. The concepts of the coda or the syllable itself have no theoretical status whatsoever. For arguments *cf.* Kaye, Lowenstamm & Vergnaud (1989).

These three constituents can be associated to a skeletal point in a one-to-one manner or they can branch. The latter option is restricted by the concept of government; a branching constituent must fulfil certain conditions in order to contract such a relationship. Government is defined as a structural, asymmetric dependency relationship between two positions (governor and governee). It is strictly local (the governor has to be adjacent to its governee on the skeleton,

nothing may intervene), strictly directional (left-headed within constituents) and subject to additional restrictions as regards melody (only charmed segments are governors "by right"; for neutral segments to be governors, they have to be more complex than their dependant). (7) lists all the possible configurations.

(7)   a.   non-branching constituents

        b.   branching constituents
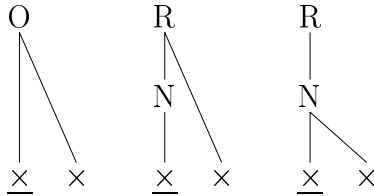
The representations in (7b) fulfil all the structural requirements for government; for the requirements on melody see below. The governor (underlined) is to the left of its governee and nothing intervenes, which makes the relationship strictly local.

From what we have said so far, it follows that constituents can maximally be binary branching. This theorem is to be derived from the conditions of locality and directionality. The representation in (8) cannot meet these requirements and is thus universally excluded. If the leftmost skeletal slot ($\times_1$) were to govern, the principle of locality would be violated as the dependant $\times_3$ would not be adjacent to its governor. The situation is equally bad in the case of $\times_2$ being the governor — both governees would be adjacent; however, strict directionality is violated. If $\times_3$ were the governor, none of the principles could be met, as directionality would be completely disobeyed and $\times_1$ would not be adjacent.

(8)   *   R
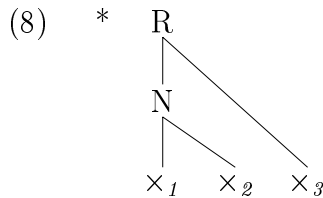
The structures in (7) are thus the only possible ones. However, additional requirements have to be met, *i.e.* the governing skeletal slot has to host a charmed

melodic expression ($^+$ or $^-$) or, if it does not, it has to be at least as complex as its governee (Harris 1990). In any case, the governee has to be charmless ($^\circ$). From this it follows, for example, that stops typically make good governors, while dependent positions are usually filled by sonorants.

Not every position on the skeleton has to be filled, *i.e.* GP recognises the necessity of allowing for empty positions. This might be unusual from the point of view of mainstream phonology and it is clear that "empty nuclei cannot be used as a 'phonological seasoning' to be sprinkled over phonological representations whenever their presence is required" (Kaye 1990: 313). Rather recent (but nevertheless convincing and extensive) argumentation in favour of empty positions comes from Szigetvári (1999), who demonstrates that they are but a logical consequence of autosegmental phonology. It is general practice to account for certain phenomena by making use of floating tones or to assume that certain melodic material shows up in liaison contexts only. In other words, in these situations we are dealing with melodic structures without skeletal slots. Empty positions are the exact opposite and thus no more or no less natural that unassociated melody. The criticism of unwarranted abstractness has to be countered in the following way:

(9)   While it is true that accepting skeletal positions that fail to be interpreted phonetically does bring some abstractness into a theory, it is controversial whether their rejection *is* the null hypothesis. The generative power of a theory having syllables of an unlimited size may be just as excessive as that of one having empty skeletal positions, what matters is whether there are adequate means of curtailing the possibilities.
(Szigetvári 1999: 14)

In other words, the incorporation of empty positions is not only desirable for theory-internal reasons, it is in fact also a means to achieve greater explanatory adequacy. Ségéral & Scheer (1999: 17) argue that

(10)   [e]mpty categories burden the grammar because they require special care [...]. Nevertheless, their existence is a necessary condition for explanations. [...] If grammar is not free in its moves because it must create or maintain the conditions requested for the existence of empty categories, a step towards a more constrained model is made. The challenge, as for any other scientific theory, is to propose a model that is as constrained as possible while covering all relevant data.

There are different means to meet these special conditions under which empty categories can exist. One of them is domain-final licensing. As Kaye (1990) claims, words ending in a consonant actually end in a final empty nucleus which is allowed to remain silent due to its position in the string. The English word *keep* therefore has the following representation.

(11)

O R O R
| | | |
    N   N
| |\ | |
× × ×   ×   ×
| |/
k   i   p
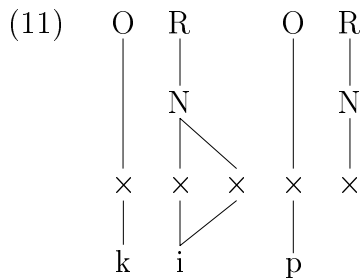
Another way of allowing a nuclear position to remain silent is by a special kind of government. In order to explain this, we will have to make a slight detour and take a closer look at how constituents can relate to each other. So far, we have only seen instances of government within constituents; it is assumed that there are similar relationships between constituents as well (Kaye, Lowenstamm & Vergnaud 1989). The following examples illustrate the possibilities of government between constituents. Note that in these configurations (contrary to government within constituents) the governor is on the right-hand side.

(12) onset to post-   nucleus   nucleus
      nuclear position   to nucleus   to onset

R   O   R   O   R   O   R
|\ | | | | | |
N | N | N | N
| \ | | | | | |
× ×   ×   ×   ×   ×   ×   ×
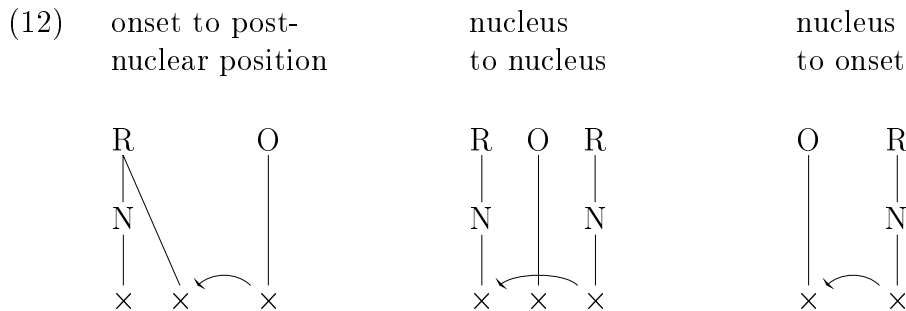
Government from an onset to the preceding post-nuclear position is what we find in clusters such as *rd*. Here, conditions on the melodic properties of the associated segments hold which are similar to those found in a branching onset — but in mirror-image fashion.[5] Government between a nucleus and the preceding

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[5] Note that while the mirror-image of a branching onset usually seems to qualify as a governing domain of post-nuclear position and onset, the reverse does not hold true: *nd* is a well-formed and widely attested cluster (post-nuclear position followed by an onset), but *dn* does not make a good branching onset (Kaye, Lowenstamm & Vergnaud 1989: 55).

onset expresses the assumption that an onset somehow has to be licensed to exist by its attendant nucleus. We will return to this issue in chapter 5.

What we are especially interested in here is the example of government between two nuclear positions. As can be seen in (12), this is the only case where another constituent (an onset) may intervene; it is crucial, however, that this onset does not branch. A government relation holding between two nuclei is termed **Proper Government** (henceforth: PG). An empty nuclear position which is properly governed is allowed to remain silent, as formulated in the phonological **Empty Category Principle** (ECP).[6]

(13)   Empty Category Principle

A properly governed empty position does not have to have a phonetic realisation.

In other words, an empty nuclear position can remain inaudible if taken care of by PG; otherwise it has to be realised. This amounts to saying that every nuclear position has inherent phonetic content, even if it is empty in terms of elements. The specific quality of the surfacing vowel can vary from language to language. However, we might expect some central vowel like [ə] or [ɨ]. PG can only obtain under certain special conditions. These are given in (14), following Kaye (1990: 313).

(14)   A nuclear position α properly governs a nuclear position β iff
    a. α is adjacent to β on its projection
    b. α is not itself licensed
    c. No governing domain separates α from β

In the case of PG, adjacency is defined on a separate level of projection where only nuclei are to be found. PG cannot skip positions (on the relevant level of projection) or affect more than one position. The governor may not itself be a properly governed empty nucleus (it must not be "licensed"[7]). The last condition

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[6] Two remarks are in order here. Firstly, Kaye, Lowenstamm & Vergnaud (1989) claim that PG between a filled nucleus and an empty one is only a special case of PG. The same *right-headed* relationship is assumed to hold also for geminates and long vowels. However, in the very same article they claim that long vowels display government within branching constituents which is *left-headed.* Secondly, the wording of the ECP as given in (13) is in the spirit of Kaye, Lowenstamm & Vergnaud (1989) who state that an empty nucleus *can* remain silent. It runs against the conception as proposed in Kaye (1990: 313) or Brockhaus (1995: 199) where a properly governed position has no phonetic realisation, *i.e.* it *must* be silent. The analysis of French in Charette (1990, 1991) suggests that an empty nucleus will not remain silent if it has a task to fulfil.

requires that no governing domain intervene between governor and governee in a relation of PG. For example, PG must not apply over a branching onset.

As in all the cases of government between constituents, PG is right-headed. We will see in chapter 4 that Gibb (1992) and Rowicka (1999) challenge the right-headedness of PG. However, while Gibb assumes that there is a parameter for headedness, Rowicka claims that PG universally takes place from left to right. We will return to this issue in more detail.

2.2 Recent developments

Over the years, many authors have contributed to GP. While there is a common core that most of these people agree on, the exact formal mechanisms and basic objects have been the issue of much debate. Both the theory of melody and the theory of structural organisation have undergone major revisions.

Let us first turn to the question of the internal segmental make-up. We saw in 2.1.1 that Standard GP assumes 10 elements as the building blocks of melodic expressions. Considering that an element can be interpreted on its own or in combination with a (principally unlimited) number of operators, it is evident that we face serious over-generation. Also, it is not clear why certain elements should be restricted to particular syllabic constituents (such as A^+ to nuclei and $R°$ to consonantal positions). What is even worse, certain existing objects like the low nasal vowel [ã] were disallowed by charm theory, *cf.* Cobb (1993). Thus, attempts have been made to modify element theory. One of the victims of these changes was charm theory, but also the number of elements has been greatly reduced.

The Revised Theory of Elements (Kaye 2000) assumes that there are only the 6 elements in (15).

(15)

element	salient property
I	palatal
A	non-high (vowels)/coronal (consonants)
U	labial
H	stiff vocal folds
L	slack vocal folds
ʔ	occluded

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[7] As Szigetvári (1999: 67) correctly points out, "[t]he notion of licensing is used in several partly overlapping, partly contradictory senses". We will return to this issue in chapter 5. For the moment it will suffice to say that the condition in (14b) states the following: the proper governor must not itself be the governee in another PG relation.

The difference between head and operator position is retained. The Revised Theory of Elements also allows for the head position to stay empty, which is used to express velarity in consonants and the contrast of [±ATR] in vowels. The following chart gives some illustration.

(16)

expression	phonetic interpretation
(I̲)	[i]
(I, _)	[ɪ]
(ʔ, U)	(neutral) [p]
(ʔ, A)	(neutral) [t]
(ʔ, _)	(neutral) [k]

Licensing constraints, which are "language-specific combinatory laws on phonological expression" (Kaye 2000: 2), are a new feature in the theory. Their task is twofold (Cobb 1993). Firstly, they function as filters for the phonological expressions of a particular language. Even the reduced inventory of 6 elements still over-generates. Licensing constraints take a form like "U must be head", as a result of which they cut back on the combinatory possibilities of expressions. Secondly, they make predictions about the phonological processes occuring in a certain language. With "U must be head" being a licensing constraint in the language in question, no process could create an expression whereby U ends up in the operator position.

Let us now turn to constituent structure. In a widely cited article, Lowenstamm (1996) proposes that syllabic constituents are to be done away with. Instead of having onsets, nuclei and post-rhymal positions linked to skeletal slots, he assumes that the skeleton is nothing but a tier of strictly alternating vocalic and consonantal positions. The representations in (17a) are thus replaced by those in (17b), *cf.* Larsen (1994), Lowenstamm (1996), Scheer (1998).
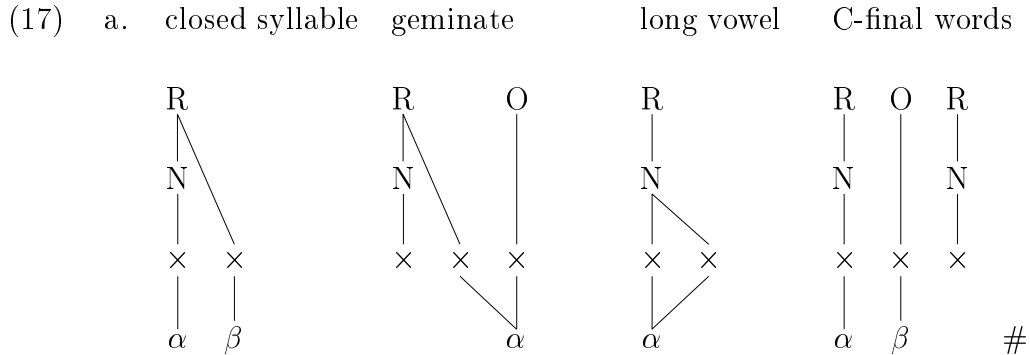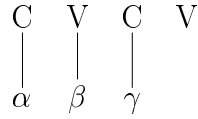
(17) a. closed syllable   geminate   long vowel   C-final words

b.   closed syllable   geminate

$$
\begin{array}{cccc}
\text{C} & \text{V} & \text{C} & \text{V} \\
| & | & | & \\
\alpha & \beta & \gamma &
\end{array}
\qquad
\begin{array}{cccc}
\text{C} & \text{V} & \text{C} & \text{V} \\
& \diagdown & \diagup & \\
& & \alpha &
\end{array}
$$

long vowel   C-final words

$$
\begin{array}{cccc}
\text{C} & \text{V} & \text{C} & \text{V} \\
& & \diagdown & \diagup \\
& & \alpha &
\end{array}
\qquad
\begin{array}{ccc}
\ldots & \text{C} & \text{V} \\
& | & \\
& \alpha & \quad \#
\end{array}
$$
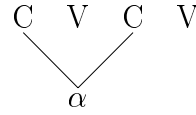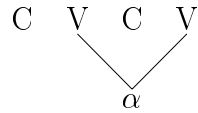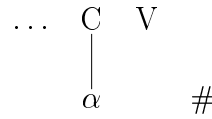
As is evident from (17b), there is no distinction between the skeletal tier and a higher level of syllabic organisation. All the available information about "constituency" (*i.e.* the distinction between C and V) is directly encoded in the skeleton. Branching is no longer possible.[8]

One of the consequences of such an approach to phonological structure is the sudden increase of empty positions. As we saw in (10), Ségéral & Scheer (1999: 17) argue that this is a necessary step towards explanatory adequacy. As it turns out, accepting CV as the only "syllable" type along with a re-interpretation of notions like government and licensing also offers a convenient way of accounting for central phenomena such as lenition (Ségéral & Scheer 1999, Szigetvári 1999). These developments are the crucial background for the present thesis and thus have to be dealt with in more detail. However, we will postpone this discussion until chapter 5. Now that a basic sketch of GP has been given, let us turn our attention to Finnish.

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[8] As a consequence, both the terms "onset" and "C position" as well as "nucleus" and "V position" are often used interchangeably.

Chapter 3

Finnish phonology

This chapter is to give a short overview of Finnish phonology. First we will look at the basic properties of the system, such as the segment inventory and the possible structural patterns. After that, CG will be introduced in some detail in a section of its own. All these issues are presented in a fairly traditional way, *i.e.* we will concern ourselves with phonemes, even though this concept is of no importance in GP (Kaye 1989: 149–154) and will in fact hardly feature in the analysis to come. Also, the facts of gradation will be explained by means of the notion of the syllable, which has no status in GP (Kaye, Lowenstamm & Vergnaud 1989). However, such an approach seems sensible as problems inherent in traditional accounts will become evident in the course of this exposition.

3.1 Basic facts

3.1.1 Phoneme inventory

Whereas the number of vowel phonemes seems to be widely accepted, the number of consonants is and has been a matter of debate. This is largely due to the question of whether segments exclusively or nearly exclusively occurring in loans or foreign words should be included (Fromm 1982: 32). According to Karlsson (1983), Finnish has 8 vowels and 13 consonants.

(18) a. Finnish vowels according to Karlsson (1983)

	FRONT		BACK
HIGH	i [i]	y [y]	u [u]
MID	e [ɛ]	ö [œ]	o [ɔ]
LOW		ä [æ]	a [ɑ]

b. Finnish consonants according to Karlsson (1983)

	BILABIAL/ LABIODENTAL	DENTAL/ ALVEOLAR	PALATAL/ VELAR	GLOTTAL
STOPS	p [p]	t [t] d [d]/[ɾ]	k [k]	
FRICATIVES		s [s]		h [h]
LIQUIDS		l [l] r [r]		
NASALS	m [m]	n [n]	/ŋ/ [ŋ]	
SEMI-VOWELS	v [v]		j [j]	

Some remarks about the charts in (18) are in order. All segments except for *d*, *h*, *j* and *v* can be both short and long; consider the following contrasts.[1]

(19) *tuli* 'fire'   *tulee* '(s/he) comes'
      tuuli 'wind'   *tullee* '(s/he) might come'
      tulli 'customs'   *tuulee* 'the wind is blowing'
                         tuullee 'the wind might be blowing'

Karlsson (1983) does not include the glottal stop as a phoneme, which, as we will see, is crucial for some central aspects of Finnish phonology. The distribution of this glottal stop is defective. In fact it only occurs word-initially before vowels as well as word-finally as the result of a process which causes the first consonant of the following word to geminate (including glottal stops and all the segments which usually do not appear in a long form).[2] Since the glottal stop is always predictable, Karlsson (1974a: 8) argues that it has no psychological reality and thus no status in phonology. It is not present lexically; the fact that it is predictable is an indication of its subphonemic nature.[3] Its appearance in word-final position is claimed to be the manifestation of a lexical feature [± initial gemination] associated with the morpheme in question. This feature can be realised in different ways; either as zero (in phrase-final position) in forms such as *tule* 'come IMP.' or as the gemination of the following word-initial consonant (including glottal stops), *i.e. tule tänne* 'come here IMP.' is realised as *tule*[tː]*änne, tule mukaan* 'come along IMP.' as *tule*[mː]*ukaan* and *tule ulos* 'come out IMP.' as *tule*[ʔː]*ulos.*[4]

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[1] For a discussion of different conceptions of length in Finnish *cf.* Harrikari (1999a).

[2] The so-called "initial gemination", on which more in 8.2.

[3] For reasons why subphonemic properties should be included in the representations of GP in some cases *cf.* Harris (1999).

As we continue our discussion, we will see that this interpretation of word-initial gemination complicates any analysis of gradation considerably. Also, instead of deriving the sandhi phenomenon of gemination from the presence of word-final phonological material which is assimilated to the following consonant in a natural way (or deleted phrase-finally), an abstract lexical feature has to be postulated which then in turn is translated into phonetics to yield the correct output. As we will see, it is not necessary to postulate that an underlying glottal stop is present in these cases of initial gemination. Still, the effects can be modelled in a purely phonological fashion by providing the necessary space for gemination in the representation of the triggering word form. This does not amount to using phonological objects as mere diacritics, as "abstract segments" might do.[5] In fact, our analysis will turn out to be more natural than Karlsson's. We will consider this issue in more detail in 8.2.

Postulating an abstract feature like [± initial doubling] is not the only drawback of Karlsson's (1974a, 1983) analysis. The chart in (18) presents us with an interesting gap in the system of plosives. We would seem to have only one series of neutral, unaspirated stops (p, t, k), were it not for the d which tends towards being voiced. However, voice is not the crucial difference between t and d; length (d is shorter) and place of articulation (t is dental, d rather alveolar) are decisive (Karlsson 1983: 57). In addition, d is special in several other respects. It owes its existence in the modern language to two sources. Firstly, it can be the result of the gradation of t (*kadun* 'street GEN. SG.' from *katu* 'street NOM. SG.'[6]) in which case it actually derives from earlier *$\eth$ (usually transcribed as δ). Secondly, it has come into Finnish in loans (*dekaani* 'dean', *delfiini* 'dolphin', *demokraattinen* 'democratic', *jodi* 'iodine' etc.). For the moment, let us distinguish between the two as **native** *vs.* **foreign** d. The distributional facts of native d have often been blurred by sound change. In the word *sade* 'rain' (from *sataa* 'to rain') nothing is left of the earlier word-final consonant which was responsible for the d.[7] In other words, Karlsson (1974a, 1983) would have to assume that *sade* ends in a bare vowel (and bears the lexical feature [+ initial gemination]), which complicates predictions about the occurence of native d considerably. As we will see in 8.2, its distribution would be completely regular if we allowed gradation to apply to it. To that end, we would have to assume word-final phonological material in the form of skeletal space which in turn also explains initial gemination (Keyser &

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[4] Campbell (1981: 161) notes that the gemination of glottal stops only occurs in careful speech; dialects often show a single glottal stop.

[5] For the question of how abstract phonology should be *cf.* Ségéral & Scheer (2000) as an answer to Kiparsky (1968).

[6] Let us assume for the moment that Consonant Gradation is a process whereby the onset of a closed syllable is weakened. This is a considerable oversimplification, but it does not affect the present argument. The phenomenon will shortly be dealt with in more detail.

[7] Words of this sort used to end in *-k, *-h, *-t or even *-n (Hakulinen 1957: 30–31).

Kiparsky 1984; Cathey & Wheeler 1986; Gibb 1992). This is not a trick inspired by historical phonology, but rather a sensible way of accounting for synchronic distributional facts and processes, *viz.* the cooccurence of native *d* and initial gemination. Certainly the feature [± initial doubling] could somehow be used to imitate these effects; however, it would lead to a considerable complication of the mechanisms involved and seems to be far too abstract. Demanding psychological reality — as Karlsson (1974a, 1983) does — is beside the point considering the stability of the gemination process discussed, *i.e.* these facts *are* real.

If the native *d* is accounted for in this way, the remaining instances of foreign origin can be equated with *b* and *g* in loans such as *banaani* 'banana', *budjetti* 'budget', *bussi* 'bus'; *geeni* 'gene', *greippi* 'grapefruit', *gorilla* 'gorilla' etc.[8] It has to be noted though that there is a tendency for *b* and *g* to be pronounced like *p* and *k*, *i.e.* as plain stops. Only in careful speech do we encounter voiced [b] and [g]. Such a strong inclination towards merger is not given in the case *d*, the reason for which might be the existence of native instances of *d* (Karlsson 1983: 58).[9]

Similar restrictions hold for the velar nasal. Phonetically, we find [ŋ] in nasal-obstruent clusters, *e.g. Helsinki* ['hɛlsiŋki]. Intervocalically it can only appear in a long form, *e.g. Helsingissä* ['hɛlsiŋːisːæ] 'in Helsinki'. The distribution of this long [ŋː] matches exactly that of native *d*. It seems to be due to CG. Karlsson (1983: 64) notes that there are certain words like *ongelma* 'problem' or *sangen* 'very' where we never get to see an alternation, hence /ŋː/ (the long version) should be considered to be a phoneme; it is present in the lexical representation. Note for the moment, however, that *ongelma* is just as well-formed as *Helsingissä*. As soon as we begin to understand phonological activity as a condition on well-formedness, the differences disappear. We will return to the details later on.[10]

Finally, let us consider the phoneme *v*. Karlsson (1983) treats it as a semi-vowel, even though phonetically it is a fricative. As was the case with *d*, we will have to distinguish between two kinds. Firstly, *v* can appear as is, *e.g.* in *vanha* 'old', *kuva* 'picture', *rasva* 'fat, grease', *taivas* 'heaven' etc. There will never be an alternation affecting it. Secondly, it can also be the result of the gradation of *p* as in *tavan* 'custom, fashion GEN. SG.' (from *tapa* 'custom, fashion NOM. SG.'), *luvan* 'permission GEN. SG.' (from *lupa* 'permission NOM. SG.') or *arvan* 'lottery ticket GEN. SG.' (from *arpa* 'lottery ticket NOM. SG.').

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[8] Karlsson (1983) also mentions /f/ and /ʃ/ as phonemes of foreign origin, *e.g.* in *fakta* 'fact' or *šakki* 'chess'. It has to be noted that /ʃ/ is often realised as [s].

[9] The labels "native" and "foreign" are of course not meant to imply that the speakers have to know about the etymological origins of *d*. All that has to be captured is the different phonological behaviour of the two kinds. Labels like "alternating" and "non-alternating" or "type 1" and "type 2" would do equally well.

[10] We will also return to the cases similar to foreign *d*; compare the words *jodi* 'iodine' and *tango* 'tango'. In both instances we find the offending consonant in open syllables.

These examples serve to show that a phonological theory which makes use of traditional concepts like phonemes and linearity of segments is hardly capable of handling the facts. Phonological regularities cannot be captured and one has to resort to morphology and burden it with unnecessary tasks. What is in fact systematic and predictable behaviour (from the point of view of phonology) then seems exceptional.

3.1.2 Stress

Primary stress is always on the first syllable; unlike its sister language Estonian, Finnish does not even preserve the stress pattern of loans. Thus we get *prófessori* 'professor', *hótelli* 'hotel' etc.

Secondary stress falls on every uneven syllable thereafter, *i.e.* on the third, fifth, seventh etc., unless there is a stress shift. This is to say that if the syllable where we would expect secondary stress is light (*i.e.* the rhyme consists of nothing but a short vowel) and the following one is heavy (*i.e.* the rhyme is longer), secondary stress moves from the light to the heavy syllable.[11] Word-final syllables never receive secondary stress. These facts are exemplified in (20), where syllable boundaries are indicated by a dot, main stress by a doubly underlined vowel and secondary stress by single underlining.

(20)   *tun.te.a*   'to know'
         tun.te.ma.ton   'unknown Nom. Sg.'
         tun.te.ma.ton.ta   'unknown Par. Sg.'
         tun.te.mat.to.man   'unknown Gen. Sg.'

For further details *cf.* Fromm (1982: 41–42) and Holman (1975: 29–35).

3.1.3 Clusters

Let us now turn to a survey of possible clusters in Finnish. This issue is of considerable importance for our further analysis, as clusters are often resistant to CG and thus constitute an interesting control. In general, clusters in genuine Finnish words only occur intervocalically. An exception to this rule is an almost sure sign of the word being a slang expression and/or a loan, *cf. proosa* 'prose' (clearly a loan) or *skidi* 'child' (a slang expression and a loan which, interestingly, seems to come from the English word *kid*).

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[11] However, Dan Karvonen (*p.c.*) has uttered some doubts about whether the situation is really that easy and neat for secondary stress. As it will not be of importance for the rest of the analysis, we will simply assume that the facts as presented hold good.

Let us first consider clusters consisting of two segments, then longer ones. The first member of a native two-consonant cluster is subject to constraints nearly identical to those of word-final consonants, *i.e.* we mostly find alveolars. Additionally, there is large group of clusters whose first member is *h*. The combinatorial possibilities for clusters with a plosive as their first member, however, seem to be very restricted. Consider the following examples, most of which are taken from Karlsson (1983: 116–117) and Harrikari (1999a: 6–7).

(21)   a.   *-pl-*   *täplä* 'dot, spot'   *-ps-*   *lapsi* 'child'
              -pr-   *tupru* 'puff'

      b.   *-tj-*   *patja* 'mattress'   *-ts-*   *katsoa* 'to look'
              -tk-   *tutka* 'radar'   *-tv-*   *katve* 'shade'
              -tr-   *kutri* 'curl'

      c.   *-kl-*   *vikla* 'sandpiper'   *-ks-*   *yksi* 'one'
              -kr-   *vuokra* 'rent'

      d.   *-sk-*   *tuska* 'pain'   *-sp-*   *vispilä* 'whisk'
              -sl-   *kaisla* 'reed'   *-st-*   *musta* 'black'
              -sm-   *pasma* 'skein'   *-sv-*   *usva* 'mist, vapour'

      e.   *-hd-*   *lyhde* 'sheaf'   *-hn-*   *tahna* 'spread'
              -hj-   *sohjo* 'slush'   *-hr-*   *ohra* 'barley'
              -hk-   *tuhka* 'ash'   *-ht-*   *vihta* 'bath whisk'
              -hl-   *kahlita* 'to chain'   *-hv-*   *kahva* 'grip, handle'
              -hm-   *tuhma* 'bad, naughty'

      f.   *-nh-*   *vinha* 'swift'   *-mp-*   *lampi* 'pond'
              -[ŋ]k-   *kanki* 'bar, spoke'   *-ns-*   *kansi* 'lid, cover'
              -nn-   *sonni* 'bull'   *-nt-*   *kanto* 'collection'

      g.   *-rh-*   *turha* 'futile'   *-rp-*   *arpa* 'lottery ticket'
              -rj-   *karja* 'cattle'   *-rs-*   *sorsa* 'wild duck'
              -rk-   *virka* 'post, position'   *-rt-*   *kerta* 'time, turn'
              -rm-   *kerma* 'cream'   *-rv-*   *karva* 'hair'
              -rn-   *herne* 'pea'

      h.   *-lh-*   *kulho* 'bowl'   *-lp-*   *kalpa* 'sword'
              -lj-   *kalja* 'beer'   *-ls-*   *tylsä* 'boring'
              -lk-   *salko* 'mast, pole'   *-lt-*   *silta* 'bridge'
              -lm-   *kylmä* 'cold'   *-lv-*   *kalvo* 'foil'

The table in (21) does not take into account whether a given cluster is common in the language or whether it is marginal. Karlsson (1983: 117) claims that clusters consisting of plosive plus liquid (*kl, kr, pl, pr, tr*) belong to the phonological core of the language, because at least they "feel" genuine. This might, however,

be questioned, considering how many of the (few) examples are actually loans: *suklaa* 'chocolate', *lakritsa* 'liquorice', *tupla* 'double', *seepra* 'zebra', *litra* 'litre'. Also, these clusters seem to be instable diachronically, *cf.* Hakulinen (1957: 42) and Skousen (1971: 85).

Further clusters with two members can be found in Finnish. These, however, are always loans and thus not to be considered as belonging to the core (Karlsson 1983: 119). Some examples are given in the following display.

(22)
-pn-	*hypnoosi* 'hypnosis'		*-nr-*	*kenraali* 'general (N)'
-tm-	*atmosfääri* 'atmosphere'		*-nj-*	*konjakki* 'cognac'
-pt-	*apteekki* 'chemist's'		*-nv-*	*invaasio* 'invasion'
-rl-	*parlamentti* 'parliament'		*-vn-*	*klovni* 'clown'
-mn-	*hymni* 'hymn'		*-kv-*	*frekvenssi* 'frequency'

Let us now turn to longer clusters. Three segments seem to be the maximum in the phonological core; again, slang expressions and loans display even longer sequences. The general pattern of clusters with three members is sonorant-obstruent-obstruent. Examples as in the following displays, taken from Karlsson (1983: 109).

(23) a.
-lkk-	*palkka* 'wage'	*-rkk-*	*tarkka* 'exact'
-ltt-	*valtti* 'trump'	*-rtt-*	*pirtti* 'living-room'
-lpp-	*tulppa* 'plug'	*-rpp-*	*korppi* 'raven'
-lss-	*pulssi* 'pulse'	*-rss-*	*kurssi* 'course'
-[ŋ]kk-	*sankka* 'dense'		
-ntt-	*kontti* 'knapsack'		
-mpp-	*kimppu* 'bunch'		
-nss-	*kanssa* 'with'		

b.
-lsk-	*vilske* 'bustle'	*-rsk-*	*pirskeet* 'party'
-lst-	*palsta* 'column'	*-rst-*	*varsta* 'club'
-lts-	*maltsa* (a plant)	*-rts-*	*virtsa* 'urine'

c.
-mps-	*rempseä* 'free and easy'	*-nsk-*	*Ranska* 'France'
-nts-	*santsi* 'second helping'	*-nst-*	*konsti* 'means, trick'
-[ŋ]ks-	*vinksahtaa* 'to go wrong'		

Again, this is by no means an exhaustive list of what actually occurs. Loans and slang expression increase the number of possible clusters considerably. For a comprehensive survey *cf.* Karlsson (1983).

3.1.4 Diphthongs

Finnish is particularly rich in diphthongs. The charts in (24) follow Karlsson (1983: 83); (a) gives the diphthongs ending in a high vowel, (b) those in a mid vowel.

(24) a. *ai* *ei*   *oi* *ui* *äi* *öi* *yi*
          au *eu* *iu* *ou*
          ey *iy*   *äy* *öy*
      b. *ie* *uo* *yö*

3.1.5 Consonants in word-final position

Like many other languages, Finnish imposes severe constraints on which consonants can appear in word-final position. In fact, we only find alveolars, as displayed in (25).

(25) -t   *kevät* 'spring', *lyhyt* 'short', *olut* 'beer'
      -s   *pylväs* 'column', *jänis* 'hare', *sairaus* 'illness, disease'
      -n   *hevonen* 'horse', *avain* 'key', *puhelin* 'telephone'
      -r   *manner* 'continent', *sisar* 'sister', *penger* 'slope'
      -l   *ommel* 'seam', *askel* 'step', *sammal* 'moss'

Now that the basic phonological patterns of Finnish have been introduced, we can proceed to the actual topic of this thesis, Consonant Gradation.

3.2 Consonant Gradation

CG has received considerable interest in the phonological literature; analyses have been put forth in numerous publications.[12] Traditionally, it is defined by making crucial use of the notions open *vs.* closed syllable. As a first tentative step let us

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[12] To name just a few (including handbook presentations): Wiik (1967), Skousen (1971), Skousen (1975), Anderson (1974), Karlsson (1974a), Karlsson (1974b), Karlsson (1974c), Hammarberg (1974), Iverson (1978), Fromm (1982), Karlsson (1983), Karlsson (1984), Sulkala & Karjalainen (1992: 385), Kiparsky (1993), Bye (1998), McCartney (1998). All these publications deal predominantly with the synchronic phenomenon; for literature on the diachronic development of CG *cf.* among others Posti (1953) and Koivulehto & Vennemann (1996)

say that the so-called **strong grade** of a plosive can be found in the onset of open syllables, whereas the onset of closed syllables only allows the **weak grade**, *i.e.* the two grades alternate with each other. Some examples will make this clearer. At the syllable boundary of a word like *seppä* [ˈsɛpːæ] 'smith Nom. Sg.' we find the strong grade, a geminate *pp*, because the second syllable is open: *sep.pä* ("." indicates the syllable boundary). As soon as the genitive marker -*n* is added, the syllable becomes closed and CG applies, *i.e.* the geminate is weakened to a simple stop: *sepä-n* [ˈsɛpæn] 'smith Gen. Sg.'. Similarly, in *katu* [ˈkɑtu] 'street Nom. Sg.', affixation of the genitive -*n* triggers gradation, the resultant form being *kadu-n* [ˈkɑdun] ∼ [ˈkɑɾun] 'street Gen. Sg.'. Note that CG only affects plosives in voiced surroundings, *i.e.* only intervocalically or between a preceding sonorant and a following vowel.[13] The case of *katu* illustrates what is usually called **qualitative CG**, *seppä* on the other hand is an example of **quantitative CG**. Qualitative CG can be subdivided further. Following Karlsson (1984: 38–39) and Fromm (1982: 49–51), there are four groups of CG, *i.e.* four kinds of targets that CG can be applied to. (26a) represents quantitative gradation, whereas (26b–26d) are instances of qualitative gradation.

(26)   a.   geminate plosives alternate with short plosives

pp ∼ *p*	*seppä* ∼ *sepän*	'smith Nom./Gen. Sg.'
tt ∼ *t*	*matto* ∼ *maton*	'carpet Nom./Gen. Sg.'
kk ∼ *k*	*kukka* ∼ *kukan*	'flower Nom./Gen. Sg.'

    b.   short plosives alternate with "something else"

p ∼ *v*	*leipä* ∼ *leivän*	'bread Nom./Gen. Sg.'
t ∼ *d*	*katu* ∼ *kadun*	'street Nom./Gen. Sg.'
k ∼ ∅	*joki* ∼ *joen*	'river Nom./Gen. Sg.'

    c.   homorganic nasal-obstruent clusters alternate with long nasals, liquid-*t* clusters alternate with long liquids

mp ∼ *mm*	*kampa* ∼ *kamman*	'comb Nom./Gen. Sg.'
nt ∼ *nn*	*ranta* ∼ *rannan*	'beach Nom./Gen. Sg.'
[ŋk] ∼ [ŋː]	*kenkä* ∼ *kengän*	'shoe Nom./Gen. Sg.'
lt ∼ *ll*	*kulta* ∼ *kullan*	'gold Nom./Gen. Sg.'
rt ∼ *rr*	*parta* ∼ *parran*	'beard Nom./Gen. Sg.'

    d.   special cases

UkU ∼ *UvU*	*luku* ∼ *luvun*	'number Nom./Gen. Sg.'
lke/lki ∼ *lje/lji*	*kulkea* ∼ *kuljen*	'to go ∼ I go'
rke/rki ∼ *rje/rji*	*särkeä* ∼ *särjen*	'to break ∼ I break'
hke ∼ *hje*	*rohkenen* ∼ *rohjeta*	'I dare ∼ to dare'

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[13] For plosives where this structural description is not met *cf.* chapter 8.

It has to be noted that Finnish CG is not a long-distance phenomenon, *i.e.* the process is restricted to a small and sharply defined site. This is evident in longer words.

(27)   a.   *kenkä* ∼ *kengän* 'shoe Nom./Gen. Sg.'
           sankari ∼ *sankarin* 'hero Nom./Gen. Sg.'

        b.   *kukka* ∼ *kukan* 'flower Nom./Gen. Sg.'
           ikkuna ∼ *ikkunan* 'window Nom./Gen. Sg.'

        c.   *leipä* ∼ *leivän* 'bread Nom./Gen. Sg.'
           käpälä ∼ *käpälän* 'paw Nom./Gen. Sg.'

As (27) shows, a word such as *sankari* 'hero' is not affected by the suffixation of the genitive marker *-n*. The resulting form is simply *sankarin*. In contrast, the same cluster *nk* alternates with *ng* in the word *kenkä* 'shoe'. The reason for this difference is obvious. In *sankarin* the cluster is simply too far away to undergo CG. The syllable structure is not changed in the crucial way (compare *san.ka.ri* and *san.ka.rin*).

This is by no means all there is to CG in Finnish. The general rule of "strong grade in an open syllable, weak grade in a closed syllable" is broken by a number of exceptions, *cf.* Karlsson (1984: 40). We will consider these in more detail.

CG never applies before a long vowel: *jokeen* 'river Ill. Sg.' (**joeen*) but *joki* ∼ *joen* 'river Nom./Gen. Sg.'. This exception has a historical reason. In earlier stages of the language, long vowels could only occur in the first syllable of a word. Therefore, whenever we find a long vowel somewhere else, it is the result of the loss of an intervening consonant; in the example just mentioned there used to be an *h*, thus *jokehen*.[14] This sound change has led to problems in formulating the rules of CG. Being in the onset position of a closed syllable is no longer a sufficient condition for gradation; the length of the following vowel has to be taken into account. The situation is even more complicated when we turn our attention to the diphthongs. Here, CG sometimes applies before a diphthong, sometimes it does not. As in the case of long vowels, diphthongs in non-initial syllables are never basic, they are the result of the affixation of some marker like plural *-i-*. When this marker attaches to a stem ending in a short vowel, CG applies as usual; when it attaches to a stem ending in a long vowel, CG is blocked. Consider the following examples.

(28)

Nom. Sg.	stem		Ade. Sg.	Ade. Pl.
matto 'rug'	*matto-*	(short)	*mato-lla*	*mato-i-lla*
kangas 'cloth'	*kankaa-*	(long)	*kankaa-lla*	*kanka-i-lla*

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[14] This consonant is preserved in some dialects, *cf.* Skousen (1975) for further details.

In both plural forms we encounter a diphthong between the gradation site and the case ending. However, their behaviour differs when it comes to gradation. In the analysis to be proposed, these differences will not be problematic.

Another aspect is the fact that CG never occurs at the beginning of a word. The inflected form *tulen* 'I come' belongs to the infinitive *tulla* 'to come'. Although the syllable structure differs in these two words, we do not encounter any alternation, *i.e.* the infinitive is *not* *dulla. However, this very same class of verbs displays gradation as soon as the target is not in the word-initial position, *cf. riitelen* 'I argue' ∼ *riidellä* 'to argue'. This immunity of word-initial plosives does not really come as such a surprise, considering that it is a necessary pre-requisite for CG to apply in a sonorant environment (Karlsson 1974a: 92). The analysis proposed in this thesis will show how the exceptionality of the word-initial position follows automatically from our phonological model. As a matter of fact, the ungrammaticality of *dulla (as the presumed result of CG applying to *tulla*) is just what we should expect.

Note in this context that the foot is never the decisive factor for CG. If we were to attribute the immunity of word-initial plosives to their initial position in the foot, we would expect the same thing to happen word-internally. Consider the following examples, where feet are indicated by square brackets, main stress by a doubly underlined vowel and secondary stress by single underlining.

(29) [t͟oivotto][m͟ana]   'hopeless Ess. Sg.'
      [t͟oivo][t͟onta]   'hopeless Par. Sg.'
      [l͟ahjak][k͟aana]   'gifted Ess. Sg.'
      [l͟ahja][k͟asta]   'gifted Par. Sg.'
      [k͟irjoitta][v͟ana]   'writing Ess. Sg.'
      [k͟irjoi][t͟atte]   'you write 2nd Pl.'

The difference between *toivottomana* and *toivotonta* serves to show that a geminate *tt* can undergo CG and weaken to *t* in spite of being in the foot-initial position. The same holds for all the other cases. In other words, it is only the word-initial position which garantuees immunity to CG.[15]

For a reason which will become clear later on, CG occurs in the imperative forms of the 2nd singular and in the negative forms; consider *kertoa* 'to tell' ∼ *kerro!* 'tell! Sg.' ∼ *hän ei kerro* '(s)he does not tell'. This is another facet often

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[15] Note, however, that it is commonly assumed that in earlier stages of the language there used to be no CG at the boundary of the second and third syllable. This is where the foot boundary is usually located. The alternation *toivotta-a* 'to wish' ∼ *toivota-n* 'I wish' is of later origin and due to expansion of CG, *cf.* Fromm (1982: 52), Fromm & Sadeniemi (1956: 37), Koivulehto & Vennemann (1996: 166) and section 3.3 of this thesis.

claimed to be an argument in favour of the advancing morphologisation of CG. The triggering factor of CG in these cases seems to be morphological information by itself, *e.g.* the morphological category imperative. Again, this can be shown to be an illusion.

A similar case can be made out for the process of the so-called "inverted CG". An example of this is the word *savuke* 'cigarette' with its genitive *savukkeen*. Here the weak grade seems to appear in an open syllable (in the nominative). In addition to that, the "normal" relationship of "strong grade in the nominative, weak grade in the genitive" (recall *seppä* ∼ *sepän* 'smith Nom./Gen. Sg') cannot be held. The reason for this seeming complication is like in the case of imperatives mentioned before. Thus, it is neither an argument in favour of morphologisation nor of a special gradation type (as Karlsson: 331 1983 would have it).

Related to these issues is the pattern we find in a number of verbs. Consider an infinitive like *tavata* 'to meet' as opposed to the 1st singular *tapaan* 'I meet'. Encountering the strong grade *p* in *tapaan* is no surprise now that we have seen that CG is not triggered before a long vowel. The weak grade *v* in *tavata*, however, remains mysterious, as no trigger is to be seen. The same holds true of derived adjectives of the type *parrakas* 'bearded' and *parraton* 'beardless' (both from *parta* 'beard'). The cluster *rt* alternates with *rr* while the syllable structure seems to remain unchanged. Once again, these problems can be avoided with a proper model of phonology.

The issue of possessive suffixes is rather complex. As we will see in more detail in 7.3, this class of suffixes never triggers CG, in fact it seems to inhibit it. For the time being, a short example will suffice. We have already encountered the alternation *katu* ∼ *kadun* 'street Nom./Gen. Sg.' where CG applies as usual: the genitive *-n* closes the syllable and triggers gradation. With the possessive suffix *-mme* (1st plural) being affixed to the nominative we would also expect gradation to be triggered; yet this is not the case. The correct result is *katumme* 'our street', not **kadumme*.[16]

Another particularly problematic case is the present passive forms. Comparing an infinitive like *kertoa* 'to tell' to a past passive like *kerrottiin* 'it was told', nothing has to be said. CG proceeds in the normal way. The corresponding present passive *kerrotaan*, however, is different. The passive ending *-tta-* triggers gradation in the stem, but it also undergoes gradation *itself*, even though there seems to be no reason why it should.

Last but not least there is also a group of resistant clusters which never take part in gradation, as exemplified by the word *matka* ∼ *matkan* 'journey Nom./Gen. Sg.'. These will be shown not to be problematic, either.[17]

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[16] Compare this to the verbal stem *katu-* 'repent' with its 1st plural form *kadu-mme* 'we repent'. The structure of the personal ending seems to be the same as that of the possessive suffix, yet we find different gradation patterns.

Complications like these have led many linguists to conclude that Finnish CG is heavily morphologised (Fromm 1982, Hammarberg 1974, Karlsson 1974a, Karlsson 1983 etc.). The triggering context, so the argument runs, can no longer be exclusively stated in phonological terms. Morphological information like case, mood or class membership has to be used. As Gibb (1992) was able to show, this is an illusion resulting from an inadequate model of syllable structure (where the inadequacy lies in the very acceptance of the syllable as a linguistically significant concept). By abandoning the traditional notion of the syllable and adopting a more restrained model of phonological structure, most of the seemingly irregular cases just mentioned dissolve into nothing.

Let us end this section with a summary of what we have discussed so far. This summary is to serve as a checklist for further analysis. All cases will be discussed in greater detail in the course of the present thesis.

(30) a. weak grade at the onset of a closed syllable ("normal" case): *seppä* ~ *sepä-n* 'smith Nom./Gen. Sg.'

    b. strong grade before long vowel and some diphthongs: *kirkko* ~ *kirkko-on* 'church Nom./Ill. Sg.', *kangas* ~ *kankaa-lla* ~ *kanka-i-lla* 'cloth Nom./Ade. Sg./Ade. Pl.' but *kirko-i-lla* 'church Ade. Pl.'

    c. no gradation word-initially: *tulla* ~ *tulen* 'to come ~ I come'

    d. weak grade in the 2nd singular imperative (homophonous to negative form): *kerto-a* ~ *kerro!* ~ *(en) kerro* 'to tell ~ tell! ~ (I do not) tell'

    e. "inverted CG", weak grade in seemingly open syllables: *savuke* ~ *savukkee-n* 'cigarette Nom./Gen. Sg.', *tavat-a* ~ *tapaa-n* 'to meet ~ I meet', *parta* ~ *parra-kas* ~ *parra-ton* 'beard ~ bearded ~ beardless'

    f. possessive suffixes never trigger CG: *katu* ~ *katu-mme* 'street ~ our street'

    g. passive marker unexpectedly undergoes CG in the present tense: *kerto-a* ~ *kerro-tt-i-in* ~ *kerro-ta-an* 'to tell ~ it was told ~ it is told'

    h. resistant clusters, *e.g. matka* ~ *matka-n* 'journey Nom./ Gen. Sg.'

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[17] There are also a number of loans like *auto* which do not take part in CG. The same holds for names with single plosives, thus *Riku* ~ *Riku-n* (Nom./Gen. Sg.) but *Matti* ~ *Mati-n* (Nom./Gen. Sg.).

3.3 Radical and suffixal CG

All the cases that have been mentioned so far are instances of what is termed **radical CG**, *i.e.* they take place in the root of the word. In addition to that, there also used to be a related phenomenon called **suffixal CG** which occurred — as the name says — in suffixes (Fromm & Sadeniemi 1956, Hakulinen 1957, Kangasmaa-Minn 1968, Koivulehto & Vennemann 1996, Laanest 1982). Note, however, that radical CG is also to be found in certain derivational suffixes. The genitive form of the word *ranta* 'beach' is *ranna-n*; here we have an alternation between *nt* and *nn*. This is a case of radical CG; the alternation takes place in the root. However, we find the same alternation in the derivational suffix *-nto* (denoting the result or the topic of an action); consider the word *asu-nto* 'flat' (derived from the verbal stem *asu-* 'live') with its genitive form *asunno-n*.[18]

Suffixal CG has been lost in the modern language; only some remaining allomorphic variation reminds us of its former presence. It used to be quite different from radical CG both in terms of the segments it affected and in the triggering environment. The unifying aspect with radical CG is the weakenig effect which both have on the target segments.[19] Suffixal CG used to affect only single plosives (*p*, *t*, *k*) following an unstressed vowel. In other words, only a subset of the segments taking part in radical CG was also involved in suffixal CG. What is more, stress, or rather its absence, was the triggering factor. One of the present-day remnants of this is the allomorphy found in the partitive marker *-A* ~ *-tA*.[20] The fact that in this case the result of gradation is zero and not *d* is another detail showing us that the two processes, radical and suffixal CG, have developed away from each other. The variant *-tA* has been kept after a long vowel or a consonant. We thus get *maa* ~ *maa-ta* 'country Nom./Par. Sg.', *paluu* ~ *paluu-ta* 'return Nom./Par. Sg.', *sisar* ~ *sisar-ta* 'sister Nom./Par. Sg.' and *avain* ~ *avain-ta* 'key Nom./Par. Sg.'. In all the other cases we find *-A*: *talo* ~ *talo-a* 'house Nom./Par. Sg.', *sauna* ~ *sauna-a* 'sauna Nom./Par. Sg.', *asema* ~ *asema-a* 'station Nom./Par. Sg.' etc. As can be seen, the original pattern which was sensitive to stress has been replaced by other restrictions.[21] In the case of the present participle suffix, the bifurcation has gone even further. Of the two variants *-pA* ~ *-vA* only the weak grade has survived in verbal inflection, thus *saa-da*

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[18] For details and literature *cf.* footnote 15.

[19] For attempts to show that historically both processes go back to one and the same lenition phenomenon and for their evaluation *cf.* Laanest (1982), Posti (1953) and Koivulehto & Vennemann (1996).

[20] Contrary to Karlsson (1974a, 1983) we do *not* regard *-ttA* as a third allomorph of the partitive. The reason for this will become clear in section 8.2.1.

[21] Note that for some forms there is rather free variation nowadays, *e.g. korkeaa* ~ *korkeata* 'high Par. Sg.'.

∼ *saa-va* 'to receive ∼ receiving', *luke-a* ∼ *luke-va* 'to read ∼ reading', *kirjoitta-a* ∼ *kirjoitta-va* 'to write ∼ writing', *oleskel-la* ∼ *oleskele-va* 'to reside ∼ residing'. The strong grade variant can only be found in older formations where the participial meaning has been lost, *cf.* the prefix *e-pä-* 'un-, in-' (an old participle of the negation verb) or words like *syö-pä* 'cancer' (from *syö-dä* 'to eat').[22]

As the examples show quite clearly, in the modern language the meager remains of suffixal gradation have hardly anything to do with radical gradation. Many of the alternations of inflectional suffixes have been levelled in favour of the weak grade. Since suffixal CG is so different from radical CG and since it can no longer be seen as an active process, we will not investigate it here any further.

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[22] The word *syöpä* also serves to demonstrate that what used to be the strong grade of suffixal CG undergoes radical CG: the genitive form is *syövä-n*.

Chapter 4

A first approximation

4.1 Gibb (1992)

The central topic of Lorna Gibb's (1992) dissertation is the question to what extent phonology and morphology are allowed to interact. The consequences at stake in this issue are quite forcefully set forth in Kaye (1995), where it is claimed that "morphological structure has two effects on the phonology: little and none" (Kaye 1995: 302). This goes together with the minimalist assumption about phonological derivations in Government Phonology (Kaye 1992b: 141).

(31)   Processes apply whenever the conditions that trigger them are satisfied.

In this spirit, Gibb shows that Finnish CG can be explained without making an appeal to morphology — it is all phonology at work (Gibb 1992: 104). It is true that nearly all aspects of CG rely entirely on the phonological structure of the string, even those that earlier analyses used as a proof of how far CG had already gone on its way to morphologisation (*cf.* section 3.2). Here, the advantages of a proper phonological model in the form of Government Phonology are clearly to be seen. There are, however, certain aspects (like the behaviour of possessive suffixes) where close inspection of the morphological structure of a formation become crucial. We will turn our attention to the importance of morphology later on (*cf.* chapter 7).

Gibb's analysis of Finnish CG is crucially based on the direction of Proper Government. She assumes that government applies from left to right, *i.e.* the very opposite of what is usually claimed. She argues that the possibility of directionality being a matter of parameter setting had always been left open — many higher prosodic phenomena, such as stress assignment, vowel harmony and

the like differ from language to language as regards the direction they take. The central evidence, however, comes from phonotactic aspects, she claims.[1] Let us consider this in more detail. The fact that there are severe restrictions on which consonants can be found in word final position leads her to conclude that Finnish does not license final empty nuclei.

(32)   In languages where word final empty nuclei are licensed, such as English, French and Arabic, certain facts can be observed. Few or no constraints restrict which kind of consonants can occur in word final position and usually the onset which is licensed by the final nucleus can itself license a rime. Generally, in such languages, an onset which is licensed by a word final empty nucleus, is the same as an onset which is licensed by a normal nucleus.
In languages with no final nuclear licensing, such as Portuguese or Italian, the consonants which can occur in final position are rare or non-existent, and there are no trans-constituent sequences in final position. Thus 'vest' would not be a possible Italian word but is perfectly well-formed in English.
(Gibb 1992: 128–129)

It is true that there is only a highly restricted set of word-final consonants in Finnish and that in the standard language there are no word-final clusters (*cf.* section 3.1.5). In other words, the only consonants we find are alveolars (*n*, *l*, *r*, *s*, *t*). The conclusion for Gibb: Finnish belongs to the second group of languages, those without licensing of final empty nuclei. This has a far-reaching consequence. A final empty nucleus has to be licensed *somehow*, but usually being licensed by virtue of occupying the last position in a domain entails other advantages, such as (nearly) unrestricted licensing power. That is, a licensed empty nucleus in word-final position can remain empty but at the same time it can also license arbitrary consonantal material in the preceding onset; sometimes even clusters can appear in this position (Charette 1991: 134–142). A final empty nucleus that is *not* parametrically licensed either has to surface (*i.e.* it has to be interpreted) or it has to be licensed in some other way. This is the crucial point.

If the final nuclear position in words such as *sisar* 'sister' is not licensed by its position, then what *is* its licensor? Gibb (1992: 130) claims that it is the preceding filled nucleus. In other words: Proper Government in Finnish is left-headed. She admits that

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[1] Charette takes a similar position in the analysis of Wolof, Pulaar and Korean (Charette 1991: 137–139).

(33) most proper government has been seen as operating from right to left, although provision was made for the parametric nature of its directionality [...]
Strict Directionality applies only to constituent or inter-constituent government; with the directionality of projection relations being parametrically specified for each language. Thus, just as with other inter-nuclear interactions such as vowel harmony, stress and tonal phenomena, the directionality of proper government is parameterized.
(Gibb 1992: 131)

This is sketched under (34), where V_3 can remain empty because it is properly governed:

(34) C_1 V_1 C_2 V_2 C_3 V_3
         | | | | |
         s   i   s   a   r
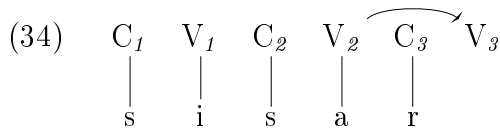
This analysis can of course easily be brought into line with the fact that there is no word-initial *tr* and the like in Finnish. As regards syllable structure, Gibb assumes that Finnish only allows non-branching onsets and non-branching nuclei, *i.e.* the same structure — strict CV — that Lowenstamm (1996) proposes for all languages. If a sequence like *tr* came to stand at the beginning of a word, it would contain an unlicensed empty nucleus, since there could be no governor to its left.[2] Loans such as *proosa* 'prose', *presidentti* 'president' or *kreatiivinen* 'creative' have to be considered as exceptions, but they are not problematic as it is not unusual for loans to introduce formerly unattested clusters into a language. In these cases, Gibb (1992: 133) assumes a branching onset, even though the native vocabulary disallows such structures.

A similar line of argumentation holds for the word-final position. Consider a word such as **vest*. Here we would have a sequence of two empty nuclei (one between *st* and the other one following it).[3] The *e* could govern the empty nucleus contained within the cluster but not the final one which therefore stays unlicensed and renders the structure ungrammatical. The empty nucleus straddled by *st* does not qualify as a governor of the final position, either.[4]

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[2] Lowenstamm (1999) proposes that there is an empty CV pair at the beginning of words. However, this makes no difference for *tr*. Being empty, the initial V-position could not govern the nucleus straddled between *t* and *r*.

[3] For evidence why *st* could not form a branching onset *cf.* Kaye (1992a) and Kaye, Lowenstamm & Vergnaud (1989). Even if it could, Proper Government would not be allowed to apply across governing domains, *cf.* Charette (1991) and Kaye, Lowenstamm & Vergnaud (1989), as well as Scheer (1998) for counter-arguments.

Under the assumption that Proper Government proceeds from left to right, CG falls out quite naturally: Gibb (1992: 150) understands PG as a licensing relation which weakens the licensing potential of the governing nucleus. A nucleus that has to properly govern a following empty nucleus has to use up some of this potential, to the effect that only a little is left for the attendant onset, which therefore gradates. (35) depicts this situation in the word *papu* $\sim$ *pavun* 'bean NOM./GEN. SG.', with Proper Government operating from V_2 to V_3 and licensing between V_2 and C_2.

(35) C_1 V_1 $C_2 \leftarrow V_2$ $\overset{\frown}{C_3}$ V_3
      p   a   p   u   n

      v
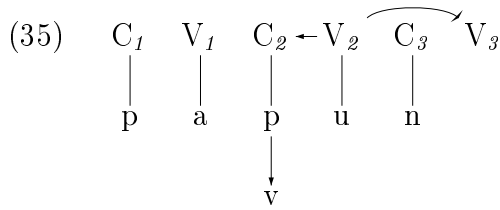
How do we account for this? According to Gibb (1992: 150), the

(36)   inherent ability of any nucleus to act as a licensor to a preceding onset is fixed. Taking a word such as ⟨papu⟩ 'bean', we find that the 'u' is licensing the preceding onset which contains 'p'. In a form such as ⟨pavun⟩, however, this same nuclear segment not only has to license the preceding onset but in addition has to properly govern the following empty nuclear position[.]

Gibb (1992: 151) argues that these two tasks, government of the following nuclear position and licensing of the preceding onset, cannot be carried out independently of each other. As a consequence, the onset has to weaken. Further restrictions take care of what exactly happens to the gradating onset. We will deal with these details in chapter 6.

A solution such as this seems intuitively plausible, but its price is rather high. By allowing for parameterisation of headedness, much of the explanatory potential of government is lost. A parameter is inherently weaker than an inviolable principle. Instead of having a universal restriction to guarantee that Proper Government can only be right-headed, variation is allowed. The grammar is thus less constrained in its moves.

An analysis exclusively making use of left-headed government has another disappointment in store, as Trosterud (1993) points out. For a word such as *pelko*

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[4] Nevertheless, all this offers no straightforward explanation why we should only find alveolars in word-final position.

'fear' the correct genitive form is *pelon* where the nucleus *o* has to take care of the following empty vocalic position and thus uses up part of its licensing power; the attendant onset *k* gradates. Notice, however, that both in *pelko* and *pelon* the *e* fulfils exactly the same structural conditions as the *o* in *pelon*. It is followed by an empty nucleus which has to be governed in order to render the structure grammatical. The only possible governor here is *e* — yet, nothing happens to the attendant onset *p*.

(37) $C_1 \leftarrow V_1 \quad C_2 \quad V_2 \quad C_3 \leftarrow V_3 \quad C_4 \quad V_4$
         | | | | | |
         p   e   l   k   o   n
                                         |
                                         $\emptyset$
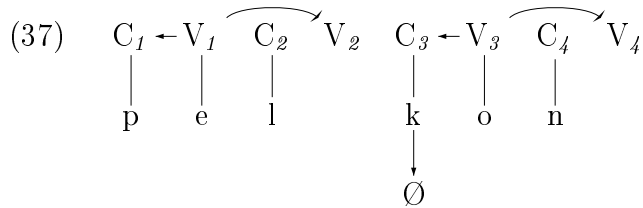
Trosterud (1993: 8) attributes this to the "morphophonological nature of the CG: It takes effect only over suffix boundaries." We do not have to fall back on morphonology or morphology here.[5] In fact, the stability of *p* is to be expected, considering that CG only takes place in sonorous environments. Trivially, word-initial plosives are not preceded by any melodic material, even less so by sonorous segments. Thus, there is no reason why CG should take place here at all, since its structural requirements are not met. The problem for Gibb (1992), however, remains. The only condition she imposes on the workings of CG is that the next but one nucleus be empty. No mention is made of the material preceding the gradation site; yet, this seems to be the decisive factor in the problem under discussion.[6]

We will see later on that the assumption of right-headed government allows us to specify in a simple way both the condition that CG only takes place in a sonorous environment as well as the requirement of the next-but-one nucleus being empty.

Note, however, that Gibb's analysis elegantly escapes one highly problematic issue. In Finnish CG, Government Phonology faces the fact that the *absence* of

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[5] We will see later on in chapter 7 which role morphological boundaries play. Except for some minor areas they play none. For another analysis claiming that the existence of a morpheme boundary is a requirement for CG *cf.* Karlsson (1974a: 92–102) and Kiparsky (1993). As Karlsson himself notes, such an assumption leads to treating nominatives like *kuningas* 'king' (as opposed to the genitive *kuninkaa-n*) as exceptional, since we are presented with the weak grade in an underived environment. The same holds for words such as *kahdeksan* 'eight' and *yhdeksän* 'nine'. These cases do not pose a problem for Gibb (*cf.* Gibb 1992: 104) or for the analysis presented here.

[6] Of course, Gibb would have to argue that the *p* in *pelko* is stable due to main stress, which is always realised on the first syllable of a word. The *e* would thus have greater licensing abilities and could simultaneously support its onset *and* govern the following nucleus.

something (here, the absence of melodic material in a certain skeletal position) is the trigger of a process and has to be referred to. Recall the structural condition on CG, depicted in the following diagram.

(38) C_1 V_1 C_2 V_2
         | | |
         α β γ

Here C_1 denotes the gradation site. V_2 *must* be empty in order for CG to take place, *i.e.* the absence of material is crucial. If we now want to say that the empty nucleus triggers CG, we are to say that a phonological process makes reference to an absent property. This is illicit in Government Phonology, as mentioned in section 2.1.1 above. Gibb does not face this problem, since she claims that Proper Government is left-headed. Therefore, the empty nuclear position is only an indirect trigger. Its appearance in the string makes it necessary for the preceding vowel to take care of it by governing it. The governing vowel thus has to use up some of its capacities and the attendant onset weakens. This is in fact a crucial aspect. We will see in chapter 5 what it entails for an analysis which assumes that Proper Government operates from right to left.

4.2   Trochaic Proper Government

Charette (1991) and Gibb (1992) are not the only ones to claim that Proper Government could operate from left to right. Since the question of directionality is of crucial importance to the rest of this thesis, let us now turn to yet another analysis that questions the common understanding of Proper Government as a right-headed relationship.

Rowicka (1999) puts forth arguments in favour of reanalysing Proper Government as left-headed, hence the term Trochaic Proper Government in analogy to metrics. In contrast to Gibb (1992) and Charette (1991), however, Rowicka assumes that Proper Government is *universally* left-headed, thus leading back to a very strong claim. There is no such thing as a parameter for headedness, but all government relations are inevitably established from left to right.

The starting point for Rowicka's proposal is closed syllable shortening in Yawelmani and Turkish. An example of this would be the Turkish word *merak* 'curiosity', which displays a short [a] in the nominative singular as well as in the nominative plural (*meraklar*), but a long [aː] in the possessive form [meraːkɨ]. The difference seems to lie in whether the syllable in question is open (long [aː]) or

closed (short [a]).[7] Rowicka points out that there are certain problems in capturing this alternation in the strict CV approach of Lowenstamm (1996). In order to assess her criticism, let us take a look at how Lowenstamm represents a long vowel.

(39) C_1 V_1 C_2 V_2

α
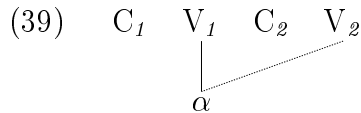
In other words, a long vowel on the surface is the result of melodic spreading from V_1 into the following empty nucleus V_2. The first part of the long vowel is considered to be the head of such a configuration. What is more, V_2 must be properly governed in order to be a possible target for spreading (Lowenstamm 1996: 431). This accounts for closed syllable shortening in a very simple way. So-called open syllables are followed by a filled nucleus which can govern the second half of a preceeding long vowel; the structure is licit. Closed syllables, on the other hand, do not meet this requirement. They are followed by an empty nuclear position, which cannot act as a proper governor. The second half of a long vowel could thus not be targeted by spreading and the configuration would be ungrammatical. Consider the following cases.

(40)   a. C_1 V_1 C_2 V_2 C_3 V_3

α β γ

b. C_1 V_1 C_2 V_2 C_3 V_3

α β
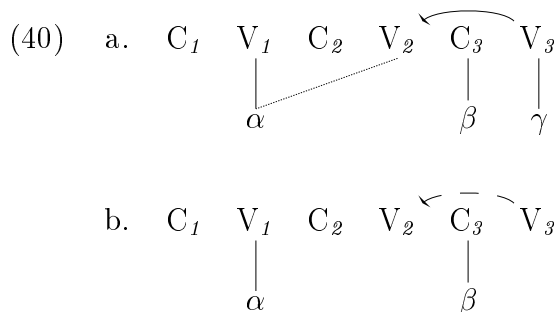
In (40a) V_2 is properly governed by V_3 and spreading can ensue. The situation is different in (40b), where V_3 is empty and not in a position to govern the preceding nucleus (indicated by a broken arrow). As Rowicka (1999: 278–279) correctly notes, such an approach raises a number of questions. Usually a properly governed empty nucleus is allowed to remain empty, yet in the configuration in (40a) it is targeted by spreading. On the other hand, an empty nucleus that fails to be governed by the following nucleus strangely enough fails to be targeted by spreading from the preceding nucleus. Instead of receiving some phonetic interpretation (second part of a long vowel or "default" interpretation as some kind

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[7] The short [e] precludes "open syllable lengthening", *cf.* Kaye (1990: 302).

of central vowel etc.) it simply remains uninterpreted and with it the whole CV syllable.[8]

Proper Government seems to be able to keep a position silent and at the same time allows that very position to be filled phonetically via spreading. This ambiguous interpretation of the potential and the effects of Proper Government is getting into even more trouble by recent and very thorough analyses of the so-called coda mirror in Ségéral & Scheer (1999), who show that Proper Government inhibits the segmental expression of its target (*e.g.* by silencing it). This makes our question even more urgent. How could Proper Government possibly show an inhibitory effect *and* license a position to be targeted by melodic spreading simultaneously? Note that this problem does not simply arise because we are comparing two different approaches here. In fact, this contradiction is already inherent in Lowenstamm (1996). This very paper claims that Proper Government licenses spreading, yet it also sticks to the interpretation of Proper Government allowing a preceding nucleus to remain empty, thus implicating that it has some inhibitory or weakening effect (*e.g.* Lowenstamm 1996: 438, footnote 2).

In order to avoid these problems, Rowicka (1999) claims that Proper Government operates from left to right. Again, a long vowel is left-headed, with the head governing the complement to its right and identifying it by spreading. Such a move makes parametric licensing of domain-final nuclei (Kaye 1990) superfluous.[9] Let us see how this fares with respect to closed syllable shortening; for the representations *cf.* Rowicka (1999: 283).[10]

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[8] Note that this problem is even more serious than it might seem at first glance. If the CV pair really remains uninterpreted, we will be faced with two empty nuclei in a row, *viz.* V_2 and V_3 in (40b). Such a configuration should not be grammatical, *i.e.* (40b) could not be the correct representation of a word like *merak*. If this is the case, then what is the relation between, say, [merak] and [meraːki]? Does the former word contain one CV pair less than the latter one? If yes, grammaticality of the forms would be ensured, but on the other hand the principle of structure preservation would be threatened. For an analysis avoiding these problems by using a slightly different representational format *cf.* Kaye (1990, 1995).

[9] The same issue is raised in Charette (1991: 137), who gets rid of one parameter (domain-final licensing) by introducing another one (directionality of Proper Government). Recall that Rowicka on the other hand claims that Government is always head-initial.

[10] Rowicka assumes that O_3 is not associated to a skeletal position, which is similar to what Charette (1991: 91) argues for in the analysis of French. O_3 is claimed to be empty so as not to block spreading. Note that such a representation is not possible in strict CV, where the CV tier *is* the skeleton.

(41) a. * O_1 N_1 O_2 N_2 O_3 N_3 O_4 N_4 O_5 N_5 O_6 N_6

        ×   ×   ×   ×   ×   ×   ×   ×   ×   ×

        m   e   r   a   k   l   a   r

    b. O_1 N_1 O_2 N_2 O_4 N_4 O_5 N_5 O_6 N_6

        ×   ×   ×   ×   ×   ×   ×   ×   ×   ×

        m   e   r   a   k   l   a   r
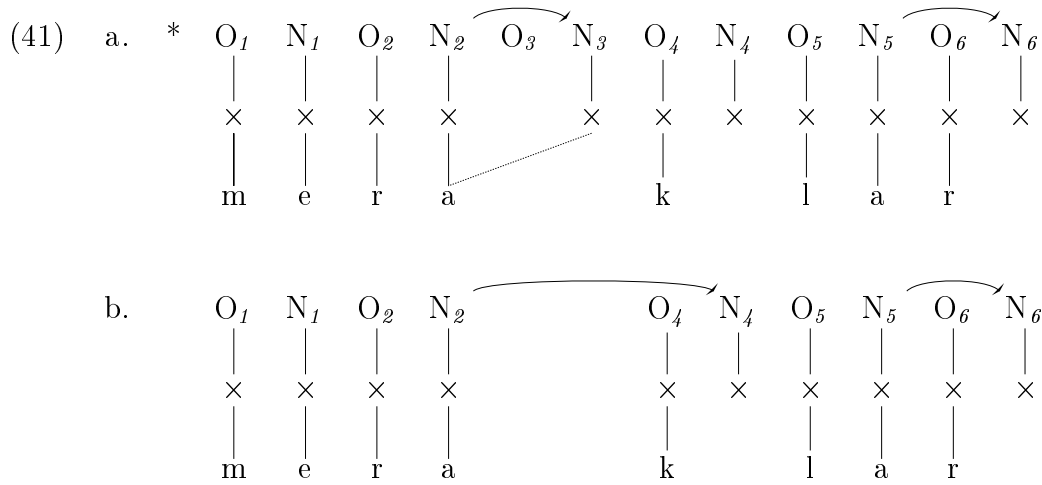
The representation in (41a) cannot be grammatical as N_4 is not being taken care of by N_3. Rowicka (1999: 280) claims that even though N_3 acquires phonetic content by spreading, it does not qualify as a governor. It stays properly governed and thus cannot itself govern. The only way to save this representation is by deletion of intervening material. The correct outcome, it is argued, is therefore as under (41b). Rowicka herself notes that the deletion of underlying material is quite problematic (*cf.* footnote 8 on page 42). However, "very little underlying information is lost (namely, no melodic elements)" (Rowicka 1999: 283). Be that as it may, we have to be aware of the fact that any kind of structure deletion is a very powerful piece of machinery and thus a major problem. Where are its limits?

There is another problem associated with Rowicka's account (even though she sees it as an advantage). Besides being right-headed, *traditional* Proper Government is assumed to establish its governing relationships starting at the right edge of the word. The "classical" example comes from Moroccan Arabic (Kaye, Lowenstamm & Vergnaud 1989).[11]

(42) a. *tan ktib* 'I write'

      C_1 V_1 C_2 V_2 C_3 V_3

      k   t   b

                        ɨ

---
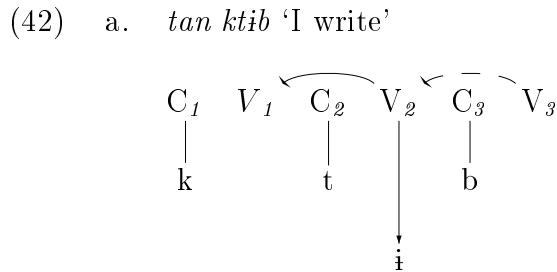
[11] Note that Kaye, Lowenstamm & Vergnaud (1989: 65) give the incorrect form *kitb* instead of *ktib* when presenting the data. The correct form can be found in Kaye, Lowenstamm & Vergnaud (1990). Furthermore, the representational format of (42a) and (42b) is different from Kaye, Lowenstamm & Vergnaud (1989). This is irrelevant to the point under discussion.

b.   *tan kitbuː* 'we write'

$$C_1 \quad V_1 \quad C_2 \quad V_2 \quad C_3 \quad V_3 \quad C_4 \quad V_4$$

$$\text{k} \qquad\quad \text{t} \qquad\quad \text{b} \qquad\quad \text{u}$$

$$\text{ɨ}$$
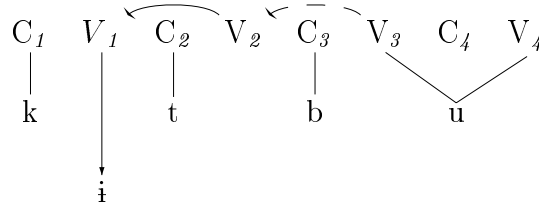
The final nucleus in (42a) is licensed due to its position in the string and thus allowed to remain empty. However, it cannot govern the preceding nuclear position, which therefore has to be realised. V_2 receiving phonetic content, it can in turn govern V_1. The final result is *ktib*. In (42b), on the other hand, we have a suffix *uː* — V_3 is filled and governs V_2, which is allowed to remain empty. This entails that it cannot take care of the preceding nuclear position and V_1 has to be realised. This gives us *kitbuː*, the correct form.

Note that this analysis requires that PG propagate from right to left. If we started establishing the government relations from the left, we would have no explanation why the first nuclear position, V_1, stays empty in *ktib* while it receives interpretation in *kitbuː*. In both cases it is followed by another empty position, V_2. Starting from the right edge is thus crucial. However, if we start from the right in Rowicka's approach, we face a problem. This becomes evident in (43), which gives yet another representation of Turkish *merak*.

(43)   * $O_1 \quad N_1 \quad O_2 \quad N_2 \quad O_3 \quad N_3 \quad O_4 \quad N_4 \quad O_5 \quad N_5 \quad O_6 \quad N_6$

$$\times \quad \times \quad \times \quad \times \qquad \times \quad \times \quad \times \quad \times \quad \times \quad \times \quad \times$$

$$\text{m} \quad\ \text{e} \quad\ \text{r} \quad\ \text{a} \qquad\quad\ \text{k} \qquad\quad \text{l} \quad\ \text{a} \quad\ \text{r}$$

$$\text{ɨ}$$
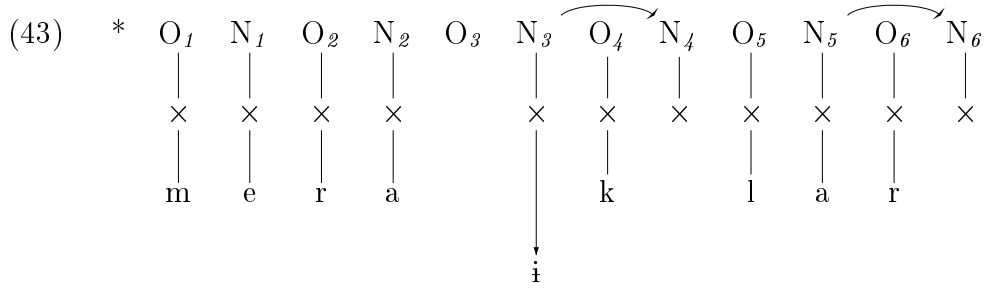
Inverting the directionality of PG also entails a change in the interpretation of the notions of governor and governee as well as of the ECP. For Rowicka (1999: 284) "[a]n empty nucleus must be phonetically realized if it properly governs another empty nucleus." What does this mean for the representation in (43)? Starting from the right edge, N_5 governs N_6, but since N_5 already has phonetic content, nothing else changes. N_4, on the other hand, is empty; N_3 has to take care of it. However, by acting as a proper governor N_3 has to be realised and an epenthetic vowel should surface. This is not the correct result. According to

44

Rowicka (1999: 282) this is due to the fact that we would be faced with vowel hiatus, which is dispreferred cross-linguistically.

Rowicka sees the ungrammaticality of (43) as a proof for two things. Firstly, we must be dealing with structure deletion, as depicted under (41b). Secondly, PG does not apply in a fixed order (right to left). Instead, "[r]epresentations must be as well-formed as possible, irrespective of whether they are examined from left to right, or from right to left" (Rowicka 1999: 286). Presumably this means that the forms *ktib* and *kitbu:* surface because they are as well-formed as they can be. Note that this a very dangerous move; it reminds one of Optimality Theory. If the surface forms only have to be as good as possible and if they are allowed to disregard what might be a universal principle (right to left in the application of PG) then what prevents them from other violations? Why not ignore the ECP altogether and have *kitib*, *ktbi*, *ktibu:* or any other possibly conceivable form? Clearly, these are serious problems.

In our discussion of closed syllable shortening one might raise the justified objection that this is not the only phenomenon which could tell us something about the directionality of government. Let us again entertain the weaker hypothesis set forth in Charette (1991) and Gibb (1992) and assume that government can go either from left to right or from right to left depending on which way the parameter is set. As we saw in section 4.1, Gibb (1992) gives an example of how in Finnish PG weakens the nucleus with the result that the preceding onset has to gradate. Is there a comparable phenomenon in languages where government operates from right to left? Taking one of our examples from Moroccan Arabic, *kitbu:*, would we expect the *b* to weaken because its nucleus has to govern the empty position straddled by *tb*? As we will see in the next chapter, Ségéral & Scheer (1999) argue quite forcefully that this should not be the case. A consonant preceded by an empty nuclear position and followed by a filled one at the same time is rather stable and resists lenition, both synchronically and diachronically. If Ségéral & Scheer are right, then why would a language like Finnish, where the governing relations are allegedly the other way round, behave so differently?

Let us consider another example. As Charette (1991: 138) puts it, "[s]upposing that phonological processes such as spirantization and devoicing are a type of lenition and that lenition involves the simplification of a segment, it is natural to propose that a segment will become less complex when it occurs within a governing domain." It remains unclear why this is natural. What is the relationship between government applying across a segment and simplification of this very segment? Maybe the segment is seen as a possible blockage for government which is why it has to be reduced in its melodic complexity. Note, however, that Ségéral & Scheer (1999) propose a much more convincing solution based on right-headed relationships. In their view, a consonant followed by an empty nucleus is not weak because of PG applying across it but rather because it is licensed by an empty nucleus, which is inherently weaker in its licensing potential than a filled position.

As Charette (1991: 138) points out, directionality of PG remains an open question. None of the examples discussed so far gives us an unambiguous clue. Therefore, let us now see how far right-headed PG can take us. Illustration will be given from lenition phenomena as these pertain to Finnish as well.

Chapter 5

Consonant Gradation meets Coda Mirror Plus

5.1 Coda Mirror

In order to get a better understanding of what CG actually is, let us take a closer look at how lenition phenomena in other languages have been accounted for. As we saw in section 2.1.1, Government Phonology provides a straighforward way to capture the melodic effects of lenition as a reduction in segmental complexity. What remains to be explained is why consonants in certain positions seem to be prone to lenition, whereas they are not when occurring in a different position. Ségéral & Scheer (1999) address this question (among other things) and present a convincing solution.

Such phonological weakness (*i.e.* a certain tendency towards lenition) is typically displayed in what is termed the "coda" in more conservative frameworks, *i.e.* in the following context.

(44) —— $\left\{ \begin{array}{c} \text{C} \\ \# \end{array} \right\}$

There are also phonological phenomena which occur in the exact mirror image context (*e.g.* the distribution of stops in Somali or fortition in Cypriot Greek), *i.e.* word-initially or after consonants, but *not* in intervocalic position. Consonants in these positions are strong in the sense that they typically resist lenition. Ségéral & Scheer (1999) call this the "coda mirror". Its context can be specified as follows.

(45) $\left\{ \begin{array}{c} \text{C} \\ \# \end{array} \right\}$ ——

47

In intervocalic contexts, however, consonants seem to be as unstable as in coda position. This can be illustrated with examples taken from the diachronic development of French (Ségéral & Scheer 1999: 2), where (46a) and (46b) illustrate the stability of the coda mirror, while (46c) exemplifies the weakness of codas and (46d) the weakness of intervocalic consonants.

(46) a.   _p_orta > _p_orte 'door'   _b_ene > _b_ien 'well'
           _t_ela > _t_oile 'canvas'   _d_ente > _d_ent 'tooth'
           _c_or > _c_œr 'heart'   _g_ula > _g_ueule 'jaws'

      b.   tal_p_a > tau_p_e 'mole'   her_b_a > her_b_e 'grass'
           can_t_are > chan_t_er 'to sing'   ar_d_ore > ar_d_eur 'ardour'
           ran_c_ore > ran_c_œr 'rancour'   an_g_ustia > an_g_oisse 'fear'

      c.   ru_p_ta > route 'road'   cu_b_(i)tu > coude 'elbow'
           pla_t_(a)nu > plane 'plane'   a_d_venire > avenir 'future'
                         (tree, dialectal)
           fa_c_ta > faite 'done'   ri_g_(i)du > raide 'rigid'

      d.   ri_p_a > ri_v_e 'shore'   fa_b_a > fè_v_e 'broad bean'
           vi_t_a > vie 'life'   co_d_a > queue 'tail'

These phenomena seem to be stable cross-linguistically. Ségéral & Scheer (1999) present more evidence from Somali, Tiberian Hebrew, the history of German, Greek etc. All these languages confirm the observation that the context in (45) is somehow responsible for strength, whereas the one in (44) may cause a consonant to weaken.

Traditional frameworks operate with the notion of "coda" in order to capture the context responsible for weakening. There is, however, no way in conventional syllable theory to characterise the coda mirror, as "syllable onset" would also include intervocalic position, which, as we have seen, is a site for lenition.[1]

How does this translate into strict CV, which, following Lowenstamm (1996), only allows for non-branching onsets and non-branching nuclei? The solution presented in Ségéral & Scheer (1999) is both elegant and simple, making use of already existing devices of the theory. It is the government and licensing relations in a word which are responsible for the different behaviour of coda mirror and coda. Consider the following representation of a consonant in intervocalic position.

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[1] Kaye (_p.c._) expresses doubts as to whether being in intervocalic position is sufficient for weakening. For these cases stress should be taken into account, _cf._ Harris (1997) and Szigetvári (1999: 59).

$$(47) \quad C_1 \quad V_1 \quad C_2 \quad V_2$$

$$\quad\quad\quad\quad\quad\quad | \quad\quad | \quad\quad |$$

$$\quad\quad\quad\quad\quad\quad \alpha \quad\quad \beta \quad\quad \gamma$$

Both V_1 and V_2 are filled with melodic material. Government between nuclear positions usually targets empty positions. Therefore, since V_1 is not empty, V_2 cannot govern it (indicated by a broken arrow). Assuming that the governing potential *has* to be used somehow, V_2 is forced to "attack" its own onset — the government relationship thus established is the responsible factor for lenition. Contrast this with a consonant following a heterosyllabic consonant.

$$(48) \quad C_1 \quad V_1 \quad C_2 \quad V_2$$

$$\quad\quad\quad | \quad\quad\quad\quad\quad | \quad\quad |$$

$$\quad\quad\quad \alpha \quad\quad\quad\quad \beta \quad\quad \gamma$$
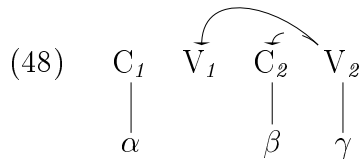
Here, V_1 is empty and therefore a willing target for government from V_2. Having used up all its governing potential, V_1 cannot hit its own onset and C_2 is thus safe from lenition. In other words, the status of governee entails being prone to lenition, whereas being ungoverned is some kind of guarantee for stability.

How does this work for word-initial consonants? Consider the following representation.

$$(49) \quad \# \quad C_1 \quad V_1$$

$$\quad\quad\quad\quad\quad | \quad\quad |$$

$$\quad\quad\quad\quad\quad \alpha \quad\quad \beta$$
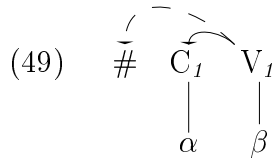
It would seem that V_1 should govern its attendant onset, C_1, because there is no preceding nuclear position for it to govern — recall that government *has* to be performed. If this were true, word-initial consonants should be liable to lenition. As they are not, something has to be wrong with the representation in (49). As it turns out, there is independent evidence (presented in Lowenstamm 1999) to suggest that in fact there is an empty CV pair at the beginning of words. This empty site serves as a signal of the domain boundary.[2] (50) gives an improved representation of the word-initial position.

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[2] It also offers a convenient explanation for certain facts about word-initial "branching" onsets and the behaviour of clitics.

(50) C_0 V_0 C_1 V_1
                         | |
                         α β
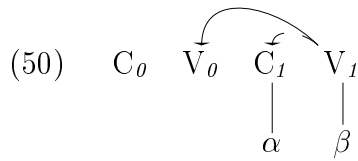
5.2   Coda Mirror Plus

Now that the basic principles and results of the Coda Mirror have been presented, let us turn our attention to Szigetvári's (1999) dissertation, which takes these results even further. In fact, Szigetvári deals with two major areas. Firstly, an amendment to the Coda Mirror is presented, termed Coda Mirror Plus, which is claimed to be even more effective in dealing with lenition. Secondly, the phonological skeleton is claimed to be made up of VC sequences as its smallest constituents, as opposed to CV pairs of Lowenstamm (1996). As we are predominantly concerned with lenition here, we will concentrate on Coda Mirror Plus.[3]

The importance of Coda Mirror Plus for the present analysis lies in the clarification it offers for central notions of Government Phonology. In order to speak about the effects which government or licensing exercise on onsets or nuclei, it has to be clear what all these concepts mean. Let us first deal with the skeletal positions.

According to Szigetvári (1999: 61), onsets and nuclei contain the prototypical properties of consonantal and vocalic segments, respectively.[4]

(51)   C positions host segments with consonantal properties and V positions host segments with vocalic properties, or rather, these positions add consonantal and vocalic properties, respectively, to segments they host.

Therefore, nuclei are loud (this is their central property), they aim at being pronounced, unless they are somehow silenced by external influence (as in the

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[3] There is another, much more pragmatic reason why the theory of VC will not feature in this thesis. It does not allow us to express the relevant distinctions. In this theory both *katu* 'street Nom. Sg.' and *kadun* 'street Gen. Sg.' have the same structure — they both end in a consonantal position, empty in *katu* but filled in *kadun*. There is no way how the different status of this word-final consonantal position could affect the preceding nucleus. In other words, the crucial difference between *katu* and *kadun* cannot be stated. Note, however, that VC and Coda Mirror Plus are logically independent from each other. We can thus dismiss the former while still making use of the benefits of the latter.

[4] A similar proposal was also put forth in Rennison (1996).

case of government). Onset positions, on the other hand, are silent, they are only realised if forced to by external influence. (Under this interpretation, lexically associated melody counts as such external influence.) Thus, C and V form the two poles of the sonority hierarchy.

There are two ways in which these skeletal positions can "communicate" with each other: government and licensing. Both of them are strictly directional (right to left) and strictly local (intervening categories of the same kind cannot be skipped). Just as in Coda Mirror, the difference between government and Proper Government is lost. Both are subsumed under the more general term government.[5]

The notion of licensing is used with different interpretations in phonology, as Szigetvári (1999: 67) points out. We will not go into details here but come straight to the interpretation given in Szigetvári (1999: 70).

(52)   [L]icensed positions are better at keeping their melodic content, but
        an unlicensed position may just as well remain associated to all the
        melody it is lexically furnished with.

Licensing is thus to be seen as a back-up for melody. This is what is often claimed in GP. However, Szigetvári's interpretation is special in one respect. As he proposes that the skeleton is made up of VC pairs instead of CV pairs, licensing is used as a kind of glue to keep these VC units together and concatenate them into longer strings. Illustration follows.

(53)

The proposal is interesting, but as we remain faithful to CV units in this analysis (*cf.* footnote 3 on page 50), it will not be of much inportance to us.

Let us now turn to the other possibility for a relationship between skeletal positions: government. Government is destructive in its effects, it inhibits the realisation of segmental material. It targets both (empty) vocalic positions (recall the example from Moroccan Arabic in section 4.2) as well as consonantal positions. However, seeing government as a simple counterpart to licensing is — as Szigetvári justly notes — somehow problematic.

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[5] Henceforth, the two terms will be used interchangeably.

(54)   [I]f government is a counterforce to licensing — one of them in-
hibiting, the other supporting the maintenance of melody — we
expect similar outcomes for the two types of lenition, being gov-
erned or unlicensed, since the manifestation of both is the loss of
melodic contrastivity. Yet this is far from what we find [...]. The
other problem is that this formulation of government is strongly
dependent on a particular set of theories of melodic representation,
which assume that phonological lenition is exclusively capturable
as loss of melodic content. [...] [T]he alternative definition of gov-
ernment to be proposed presently is such that it is also reconcilable
with competing theories which posit a richer melodic structure for
sonorants than for obstruents.
(Szigetvári 1999: 66)

In order to avoid this problem Szigetvári (1999: 66) defines government in a
looser sense.

(55)   Government spoils the inherent properties of its target.

That is to say that governed skeletal positions lose their inherent qualities
which were presented in (51). In other words, they lose their ability to add conso-
nantal and vocalic properties, respectively, to the position in question. An onset
thus becomes louder and more sonorous; a vocalic position, on the other hand,
loses its inherent loudness and becomes silent.[6]

Together, these notions (*i.e.* onsets and nuclei, government and licensing) are
sufficient to describe and to explain phonotactic constraints and other phenom-
ena handled by (complex) syllable structure in more conservative approaches to
phonology. Ample illustration and evidence is given in Szigetvári (1999), so we
will just shortly review the resulting basic segmental patterns proposed there in
order to finish off our survey of Coda Mirror Plus. If we assume two different
kinds of skeletal positions and two kinds of inter-segmental relationships, there
are eight logical configurations for these to contract. (56) illustrates this.

---

[6] Szigetvári (1999: 67) argues that the effect on consonantal positions is gradual, whereas on
vocalic positions it is absolute: "The content of a C position *may* lose *part of* its stricture
characteristics, becoming vowellike is gradual. On the contrary, a governed V position can
do but one thing, become mute [...]." We will see later on in section 5.3 that a nucleus
might have more alternatives than that.

(56)

		relationship	*targeting*	*emanating from*
(i)		government	V	V
(ii)			C	V
(iii)			V	C
(iv)			C	C
(v)		licensing	V	V
(vi)			C	V
(vii)			V	C
(viii)			C	C

Possibility (i) is well known from vowel-zero-alternations which have tradition-ally been handled by Proper Government in Government Phonology, *cf.* section 4.2. Number (ii) was discussed in our survey of the Coda Mirror; this is the rela-tionship responsible for intervocalic lenition. Configuration (iii) is claimed to be impossible — in fact it is hard to imagine why a clearly non-head position (C) should govern a head position (V); by the very same token configuration (vii) is ruled out as well. Number (iv) is what we find in coda clusters, *i.e.* clusters of the type *rt*. This is depicted in (57).

(57) C_1 V_1 C_2 V_2
        | |
        r   t
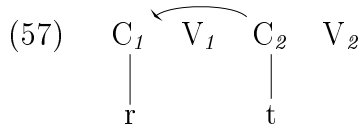
These were the only possibilities for government to go into action. As for licensing relations, number (v) is what we find in long vowels and diphthongs, as illustrated in the following diagram.[7]

(58)   a. C_1 V_1 C_2 V_2
                        | |
                        α β

        b. C_1 V_1 C_2 V_2

                              α

---
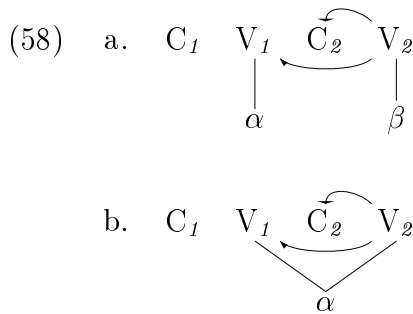
[7] Note that in order to keep displays understandable we will keep to a simple convention. Arrows above the CV tier indicate government, arrows underneath or within the CV tier indicate licensing.

Possibility (vi) is the "normal" case of a nucleus licensing its own onset. Nothing else has to be added. The configuration in (vii) being excluded (see above), it only remains to illustrate (viii): Szigetvári (1999: 122) claims that this is what we find in onset clusters, whose rather complex representation is given in (59).

(59) C_1 V_1 C_2 ← V_2 C_3 V_3

                                   | |
                                   t   r
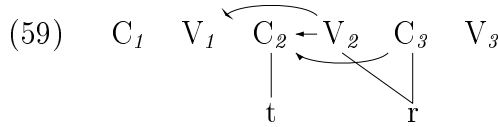
Note that C_2 is claimed to be doubly licensed, which accounts for the strength of this position.

The advantages of Coda Mirror Plus lie in the fact that it allows a clear-cut differentiation of consonant clusters and in the integration of stress when accounting for lenition. Also, as was already pointed out on page 50, central concepts of the theory (government, licensing, C, V) are given a clearer interpretation. We will now return to Finnish and see if all this helps us in understanding CG.

5.3   Applying Coda Mirror Plus to Finnish

In this section we will see how the tools provided by Coda Mirror and Coda Mirror Plus enable us to come up with an analysis of Finnish CG. We will examine each of the subgroups (as displayed in (26) on page 28) in turn, starting off with the simple stops.

5.3.1   Simple plosives

Let us consider a word of the form $C_1V_1C_2V_2$. As we have seen, the consonant in the absolute onset, C_1, is typically relatively stable as regards lenition. On the other hand, the consonant in the middle of the word (C_2) is prone to lenition. This was illustrated in (46). If we compare this to the facts of Finnish, two interesting issues can be recorded: Firstly, plosives in the onsets of Finnish words are always resistant to CG. There is no such thing as an alternation *tulen* 'I come' ∼ **dulla* 'to come'. The correct infinitive form in this case is *tulla*. In other words, the resistance of word-initial plosives to CG in Finnish is exactly what we expect from lenition phenomena in numerous languages of the world, as consonants at the beginning of the word are in a strong position. The second interesting issue is the fact that plosives in intervocalic position (such as *p* in *lupa* ∼ *luvan* 'permission') are prone to a kind of lenition — CG — *depending on*

the context, i.e. they undergo CG if followed by an empty nucleus. Some more examples of this are given in (60), which is but a repetition of (26b):

(60) $p \sim v$ *leipä* $\sim$ *leivän* 'bread Nom./Gen. Sg.'
            $t \sim d$ *katu* $\sim$ *kadun* 'street Nom./Gen. Sg.'
            $k \sim \emptyset$ *joki* $\sim$ *joen* 'river Nom./Gen. Sg.'

This shows that the lenition of intervocalic plosives takes place provided some additional conditions are fulfilled.

In order to see what Coda Mirror tells us about these facts, let us have a closer look at a $C_1 V_1 C_2 V_2$ string. Recall that the theory posits an empty CV-pair at the beginning of the actual word.[8]

(61) C_0 V_0 C_1 V_1 C_2 V_2
                      | | | |
                     α β γ δ

In a structure such as (61), C_2's liability to lenition and C_1's resistance against it follow quite automatically from the governing and licensing relations holding between the segments. Being a filled nucleus, V_2 has to govern and license a position to its left. As we have seen, Coda Mirror (Plus) conceives of government and licensing relations as being inevitable — as Szigetvári puts it, each nuclear position in the string

(62)   has exactly one load of government and one of licensing power [...]
        This capability is an inherent property of V positions, that is, V positions govern and license *unless they suffer some unfavourable external influence:* governed V positions fail both to license and to govern preceding skeletal positions.
        (Szigetvári 1999: 71, emphasis mine, M. A. P.)

V_2's licensing potential is used up on C_2. However, a relationship of government cannot be established between V_2 and V_1, since this latter position is filled with lexical material and does not have to be taken care of by government. Since V_2 *has* to govern *some* position, it ends up governing its own onset, in addition to licensing it. This is depicted in (63).

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[8] Recall that Szigetvári (1999) combines his Coda Mirror Plus with VC Phonology, i.e. in his framework we only find an empty V-position at the beginning of the word.

(63) $\quad$ C$_0$ $\quad$ V$_0$ $\quad$ C$_1$ $\quad$ V$_1$ $\quad$ $\overset{\frown}{\text{C}_2} \leftarrow \text{V}_2$

$\qquad\qquad\qquad\quad\; | \qquad\; | \qquad\; | \qquad\; |$

$\qquad\qquad\qquad\quad \alpha \qquad \beta \qquad \gamma \qquad \delta$
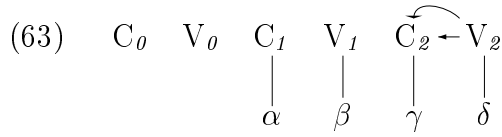
C$_2$ is thus both licensed and governed at the same time, which is exactly the reason why lenition takes place.[9]

The fate of C$_1$ is quite different. Here again we have a licensing relationship between the attendant nucleus (V$_1$) and C$_1$, but this time the consonant escapes government, since it is preceded by an empty nucleus, V$_0$, which V$_1$ has to take care of.

(64) $\quad$ C$_0$ $\quad$ V$_0$ $\overset{\curvearrowleft}{\quad\, \text{C}_1} \leftarrow \text{V}_1$ $\quad$ $\overset{\frown}{\text{C}_2} \leftarrow \text{V}_2$

$\qquad\qquad\qquad\quad\; | \qquad\; | \qquad\; | \qquad\; |$

$\qquad\qquad\qquad\quad \alpha \qquad \beta \qquad \gamma \qquad \delta$
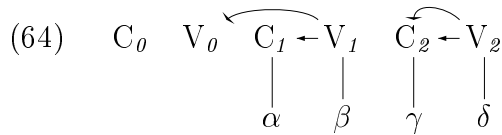
Having presented Coda Mirror Plus at work with an abstract configuration, let us now turn to Finnish and take a closer look at a pair such as *kadun ∼ katuna* 'street Gen./Ess. Sg.'. In trying to analyse CG, one might be tempted to ask a question such as, "What triggers gradation in *kadun*?" Consider the following representations.

(65) $\quad$ a. $\quad$ C$_0$ $\quad$ V$_0$ $\quad$ C$_1$ $\quad$ V$_1$ $\quad$ C$_2$ $\quad$ V$_2$ $\quad$ C$_3$ $\quad$ V$_3$

$\qquad\qquad\qquad\qquad\qquad\;\; | \qquad\; | \qquad\; | \qquad\; | \qquad\; |$

$\qquad\qquad\qquad\qquad\qquad\; \text{k} \qquad \text{a} \qquad \text{d} \qquad \text{u} \qquad \text{n}$
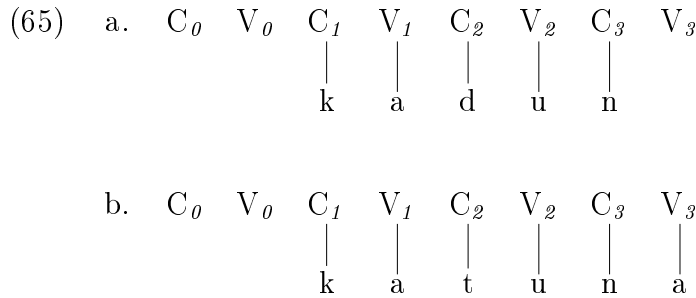
$\qquad$ b. $\quad$ C$_0$ $\quad$ V$_0$ $\quad$ C$_1$ $\quad$ V$_1$ $\quad$ C$_2$ $\quad$ V$_2$ $\quad$ C$_3$ $\quad$ V$_3$

$\qquad\qquad\qquad\qquad\qquad\;\; | \qquad\; | \qquad\; | \qquad\; | \qquad\; | \qquad\; |$

$\qquad\qquad\qquad\qquad\qquad\; \text{k} \qquad \text{a} \qquad \text{t} \qquad \text{u} \qquad \text{n} \qquad \text{a}$

As we have noted before in section 4.1, CG seems to be triggered by V$_3$'s being empty. Now, it is impossible for Government Phonology to make use of the *absence* of something, be it the absence of some segment or of melody altogether. As it turns out, we ought to have asked our question the other way round — instead of "What triggers gradation in *kadun*?" the question should run "What is it that *prevents* the form *katuna* from undergoing CG?" Note the difference: usually analyses of Finnish concentrate on the unlenited forms and then try to

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[9] This is what Szigetvári (1999: 60) calls vocalic lenition, *i.e.* loss of stricture.

identify a reason for lenition. In the present analysis, it is the lenited forms that are taken to be the "normal" case, whereas the forms in the strong grade call for an explanation. Our approach to CG is not unusual at all, consider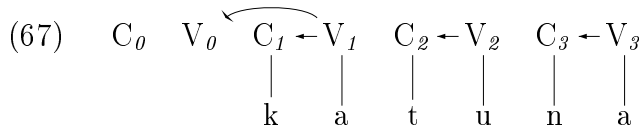ing how common and widespread intervocalic lenition is. Coda Mirror and Coda Mirror Plus have now given us the tools to analyse this phenomenon within Government Phonology. If this is the point of view we take, the form *kadun* falls out quite naturally.

(66) C_0 V_0 $C_1 \leftarrow V_1$ $C_2 \leftarrow V_2$ C_3 V_3
                          | | | | |
                          k   a   t   u   n
                                        |
                                        d
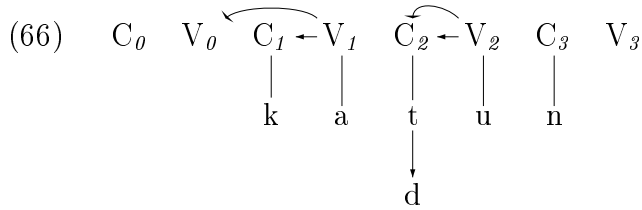
The *k* in C_1 is safe from government since V_1 has to take care of V_0, therefore it is resistant to CG.[10] C_2 on the other hand is not that lucky. Let us assume that since it is preceded by a filled nucleus, it is hit by government and therefore subject to lenition.

The form *katuna* is a bit trickier. Again, let us have a closer look at its (preliminary) representation.

(67) C_0 V_0 $C_1 \leftarrow V_1$ $C_2 \leftarrow V_2$ $C_3 \leftarrow V_3$
                          | | | | | |
                          k   a   t   u   n   a

In this case the vocalic position V_2 seems to be prevented from exercising its destructive power over the preceding nucleus. The question is: what is it that stops V_2? Comparing *katuna* to the form we were just dealing with, *kadun*, it seems clear that the presence of a filled nucleus in V_3 is responsible for the difference. Now, what kind of relationship could hold between the two positions V_2 and V_3? Let us assume that it is government: V_3 governs the preceding nuclear position V_2. But since V_2 is lexically filled, it is not liable to complete suppression. Yet, the effect of government is visible insofar as V_2 loses its potential to govern its onset. As a result, C_2 is safe from being governed by its own nucleus.

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[10] Note that this will be the same in every Finnish word. Since there is always an empty CV-pair at the beginning of words, initial consonants will always be resistant to lenition. This is exactly the result we want: CG *never* takes place at the beginning of words. This also shows that the stability of word-initial plosives is not due to stress but due to governing and licensing relationships. Onsets whose nuclei receive secondary stress are always in medial position and thus subject to CG, *cf.* section 3.2.

The attentive reader will have noticed that there seems to be a contradiction in our argument. In the case of *kadun* we proposed that V_2's governing potential could not be exercised over V_1 (because V_1 is filled) and would therefore target C_2. In *katuna* we seem to have a similar situation as regards V_2 and V_3. If a filled nuclear position cannot be hit by government (as we saw in *kadun*), then why would it not target C_3 in *katuna*? Indeed, this calls for an explanation. An analysis making contradictory use of the principles of its framework, invoking them whenever the data make this fit, seems to be rather questionable. Yet there is evidence for such different behaviour in the case under discussion, as we will see presently.

There are two issues to be considered here in order to understand what is going on. First we will have to deal with stress. Recall from section 3.1.2 that main stress in Finnish goes always on the first syllable. The problematic forms *kadun* and *katuna* are realised as ['kɑdun] and ['kɑtunɑ], respectively. In other words, the vowel which seems to reject government carries stress. This might in fact be the decisive connection. In Kaye (1995: 303) a **Licensing Principle** is stated.

(68)   *The Licensing Principle*
         All positions in a phonological domain must be licensed save one:
         the head of the domain.

Licensing in the sense of Kaye encompasses both government and licensing relations of the Coda Mirror. Main stress is a typical sign of headship within a domain. We might therefore conclude that a vowel bearing main stress does not have to — in fact: cannot — be governed. It is free from external influence.[11] This accounts for the difference we observe in our analysis of the forms *kadun* and *katuna*.

The consequences for longer words are clear. Every intervocalic singleton plosive later on in the string should be resistant to CG as the preceding vowel cannot bear main stress. A hypothetical word like **tupaka* should be **tupakan* in the genitive. It is interesting to note that there are basically no such words in Finnish.[12] The string **tupaka* does not qualify as a "good" Finnish word; it is not

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[11]   In order to make her analysis account for the stability of word-initial plosives Gibb (1992) would have had to make use of stress as well, *cf.* footnote 6 on page 39.

[12]   Why words like *haluta* 'to want' or *savuke* 'cigarette' are only apparent counter-examples will become clear in section 8.2. The *t* in *haluta* and the *k* in *savuke* are weak grades of geminates. The same holds for *uskoton* 'faithless' and the like. These cases are to be distinguished from loans like *prostata* 'prostate gland', which gives away its non-native origin already by displaying *pr*. Also, we cannot include purely inflectional endings like the partitive allomorph *-tA*. (Furthermore, the second allomorph of this case ending, *-A*, cannot

straight away impossible, but restricted to loans. And even loans usually conform to the generalisation we just stated: *tupakka* 'tobacco' is perfectly well-formed. As soon as we are past the first two syllables we only encounter geminate plosives or clusters, no matter whether we are dealing with native Finnish words (mostly morphologically complex) or loans (with very few exceptions). This statement has no bearing on sonorants, however. They are freely distributed throughout the word. These facts can be illustrated with a number of examples.

(69) a. Plosives (I): native words (usually derivations)

> *asunto* 'flat', *mustikka* 'blueberry', *vasikka* 'calf', *valinta* 'choice', *kirjasto* 'library'

   b. Plosives (II): loans

> *tupakka* 'tobacco', *sonetti* 'sonnet', *apotti* 'abbot', *apteekki* 'chemist's', *ketsuppi* 'ketchup'

   c. Sonorants

> *sankari* 'hero', *ikkuna* 'window', *huvila* 'country house', *leipomo* 'bakery', *elämä* 'life'

In other words: our assumption that main stress blocks any government can neither be convincingly proved nor can it be refuted. There are simply no controls. Judging from the behaviour of CG in *katu* ∼ *kadun* ∼ *katuna*, however, we might feel justified in stating such a connection.

The second issue we will have to consider is the internal make-up of nominal and verbal stems. There is some relation to stress, but we will try to abstract away from it. It is characteristic for underived Finnish stems to have two syllables.[13] Anything exceeding this span is a derived form or a loan. Again, there are some exceptions like *hopea* 'silver', *pimeä* 'dark', *maa* 'country' or *puu* 'tree', but by and large the generalisation holds. The second syllable of these stems is often short. Historically, long vowels in this position are the result of the loss of some intervening consonant. Holman (1975: 35ff) argues that there is a clear distribution of information in this structure.[14] The first syllable marks the beginning of lexical information and indicates this by carrying main stress. The second syllable

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synchronically be seen as related to *-tA* by CG, *cf.* section 3.3.) Some of the imperative endings contain simple, intervocalic *k* (like *luke-ḵaa-mme* 'let us read'), but they never occur before a short vowel followed by a consonant.

[13] The discussion refers to the so-called vowel stem. Note that the term "syllable" is used in its traditional, pre-theoretical sense here, as a convenient tool for describing the facts. No theoretical status is attributed to it.

[14] In this context, Holman (1975) actually talks about proto Baltic-Finnic. However, he argues that essentially the same patterns are still to be found in the present-day languages.

receives no stress; it marks the end of lexical information. Any further syllables, which are nearly always the result of derivation, have alternating secondary or zero stress and convey derivational and inflectional information. This pattern also becomes evident in syllable structure (even though language history has blurred the picture considerably): superheavy syllables used to be restricted to the initial syllable. Furthermore, Austerlitz (1976: 13) points out that

(70)   verb stems with final *i*, *u/y* and *o/ö* are suspect of not being monomorphemic. In other words, the only genuine monomorphemic stems would have stem final *e* and *a/ä*. [...] Similarly, the only incontrovertibly (bisyllabic) monomorphemic nouns are those with stem final *e* and *a/ä* [...].

Summing up: outside the first syllable, less phonological material is supported. The morphological status of non-initial syllables combined with the absence of main stress might give us important hints as to why government applies to a vowel in the second (or any later) syllable, while the first syllable seems to be resistant to it.[15]

In addition to being melodically and/or prosodically impoverished, stem-final vowels are also rather unstable.[16] This is quite clear from inflectional and derivational patterns. Consider a word such as *vanha* 'old': in combination with the plural marker *-i-*, this final *-a* is turned into *-o*, we thus get *vanh-o-i-ssa talo-i-ssa* 'in old houses'. If followed by the comparative marker *-mpi*, *-a* turns into *-e*, thus *vanh-e-mpi* 'older'. Suffixation of the superlative marker *-in* presents us with a third possibility: the final vowel is completely lost and we get *vanh-in* 'oldest'.[17] There are many examples of this kind. The following chart will illustrate some more.

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[15] For the importance of stem-final vowels for class assignment *cf.* Pöchtrager, Bodó, Dressler & Schweiger (1998).

[16] This does not hold true of rounded vowels, which are never subject to any alternations and therefore display extreme stability.

[17] Note that this proneness to change is specific to *final* vowels, there is no such thing as ablaut or umlaut that would affect non-final vowels.

(71)

| Alternation	Examples
$i \sim e$	*järvi $\sim$ järv-e-n* 'lake NOM. SG./GEN. SG.',
	talli $\sim$ tall-e-j-a 'garage NOM. SG./PAR. PL.'
$a \sim o$	*kana $\sim$ kan-o-j-a* 'chicken NOM. SG./PAR. PL.'
$a \sim \emptyset$	*muna $\sim$ mun-i-a* 'egg NOM. SG./PAR. PL.'
$ä \sim \emptyset$	*pesä $\sim$ pes-i-ä* 'nest NOM. SG./PAR. PL.'
$e \sim \emptyset$	*tule-n $\sim$ tul-i-n* 'I come/I came',
	saare-n $\sim$saar-ta 'island GEN. SG./PAR. SG.'

It is interesting to see that these generalisations about stem-final vowels more or less also hold when the vowel is part of a derivational suffix, *i.e.* in longer stems. They are also true for loans. We thus find *valinta $\sim$ valint-o-j-a* 'choice NOM. SG./PAR. PL.' and *myymälä $\sim$ myymäl-̈o-i-tä* 'Nom. Sg./Par. Pl.' as well as *tunneli $\sim$ tunnel-e-i-ta* 'tunnel NOM. SG./PAR. PL.'.

Let us now address the more general question whether it is desirable at all for government to target filled nuclear positions. Generally, both government and licensing can be seen as mechanisms to create indices within the string. Phonological representations make an appeal to government and licensing, they react to them in the form of phonological processes, by means of which redundancy is created. This also holds true for Finnish CG. An alternation such as *katu $\sim$ kadun $\sim$ katuna* 'street NOM./GEN./ESS. SG.' has an advantage over the non-existing *katu $\sim$ *katun $\sim$ katuna*: the form of the stem gives an important clue as to the structure of the suffix (Anttila 1975, Nahkola 1995). Information is encoded twice, once in the structure of the suffix and a second time in the shape of the stem. Since enhancing parsibility by creating redundancy is the prime task of phonological processes (Kaye 1989), maximal use should be made of already existing devices of the theory. It is not clear why government should be restricted to targeting empty nuclei. As we have seen in the Coda Mirror and Coda Mirror Plus, government can be used efficiently in explaining lenition by simply allowing for government to apply to onset positions. Along the same lines we could argue for extending government to filled nuclear positions.[18]

Applying our discussion to the forms *kadun* and *katuna* we could say that every ungoverned vowel simply tries to govern the preceding nuclear position. In case this is not possible (due to main stress of the preceding position or due to other factors to be discussed presently), government will hit the attendant onset.

Let us see how this works for illative forms such as *tupaan* 'into the living room', where we encounter the strong grade. Here again, the vowel following the lenition site is somehow inhibited from targeting its onset. This is depicted in (72).

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[18] It would be interesting to see whether this allows for predictions about which vocalic positions are likely to be syncopated in the course of time.

(72) C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3 C_4 V_4
                        | | | |
                        t   u   p   a   n
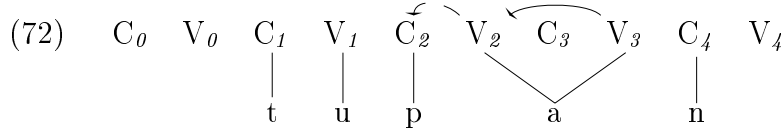
In accordance with cases such as *katuna* we will have to posit a relationship of government between V_2 and V_3.[19] V_2, being governed, cannot attack its onset, which therefore appears in the strong grade.

What remain to be accounted for are the nominative forms. Note that the nominatives ending in a vowel seem to contradict our previous analysis:[20] If government attacking its own onset (instead of the preceding nucleus) is preventing an intervocalic position from undergoing CG, then what would be the reason for *katu* displaying the strong grade?

(73)   * C_0 V_0 $C_1 \leftarrow V_1$ $C_2 \leftarrow V_2$
                             | | | |
                             k   a   t   u
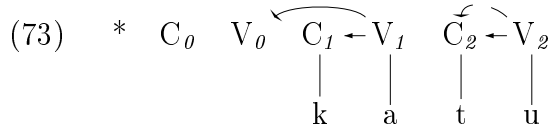
This fact can be attributed to a principle which at first glance might seem to be completely out of place here, but in fact does fulfil a function. Recall that in Finnish final nuclei are allowed to remain empty — as long as their onset is filled by an alveolar consonant.[21] In other words: being in the final position can have an effect similar to being targeted by government (as is the case with word-medial empty nuclei). Again, the vocalic position is not totally silenced, as it is lexically filled with melodic material.[22] Yet, the position behaves as if it were governed by losing its capacity to govern its onset.[23] The *t* in *katu* is therefore safe from government and surfaces as such.

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[19] This is contrary to Szigetvári (1999: 72).

[20] Alternations of the kind *sade* ~ *sateen* 'rain NOM./GEN.' will be dealt with later on. In this class, the final vowel of the nominative form is actually only an orthographic illusion.

[21] We have to bear in mind that Szigetvári (1999) strongly argues against there being a word-final empty nuclear position. As pointed out in footnote 3 on page 50, his conception of the skeleton as being made up of VC- instead of CV-pairs will not be adopted in this thesis. Therefore we can assume that there is an empty vocalic position in what seems to be a word ending in a consonant.

[22] Note that in Estonian, final vowels often tend to disappear: Finn. *sauna* 'sauna' ~ Est. *saun* 'id.', *linna* 'castle' ~ Est. *linn* 'town', *kieli* 'language, tongue' ~ Est. *keel* 'id.'. However, all these vowels appear again when inflectional endings are added, thus *saunad* 'sauna NOM. PL.' etc.

[23] As we saw with *katuna*, it does not lose its capacity to govern the preceding nucleus, though. Governing an onset can be seen as the more "marked" option; accordingly, this ability is lost first. This will be of importance in section 8.1.

5.3.2   Sonorant-obstruent clusters

Let us now turn our attention to simple stops preceded by a nasal or liquid. In strict CV one would normally conceive of such a sonorant-obstruent cluster as the following kind of structure (where T represents the plosive and N the homorganic nasal).

(74)   . . .   C   V   C   . . .
                | |
                N   T

However, if this is the case, it is not clear why we would get CG in a case such as *rannan* 'beach Gen. Sg.' (as opposed to *ranta* 'beach Nom. Sg.'). Consider the following representation.

(75)   * C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3 C_4 V_4
                            | | | | | |
                            r   a   n   t   a   n

There are two problems with the representation in (75). Firstly, the structure does not fully meet the necessary prerequisite to CG, *i.e.* that the gradation site has to be surrounded by sonorous segments, *cf.* section 3.2. Of course, one could reply, in *ranta* the gradation site is separated from the nasal by only *one empty nucleus* — it is therefore more or less a matter of interpretation whether the condition is met or not. Traditional analyses of Finnish argued that CG takes place in sonorous environments because that is what we see on the surface, but there is no guarantee for this to hold for phonological representations as well. Note that in this case the question of adjacency does not arise for a theory of constituency where the nasal can occupy a post-nuclear position, as proposed in Kaye, Lowenstamm & Vergnaud (1989). In such a theory there would be no empty position which could trouble us. However, Gibb (1992), who works in a framework much closer to Standard GP, claims that Finnish is made up of a sequence of strictly alternating consonantal and vocalic positions, adducing evidence that there should be an empty position straddled by *nt*. The second problem with (75), however, — and this is the more serious issue for the approach we have taken so far — is that V_3 would *govern* V_2. Therefore, there is no reason why CG should ever apply, assuming that it is in fact a result of government hitting its own attendant onset, as we have claimed so far. C_3 would always be safe, since government targets the preceding vocalic position, V_2. It would be quite an *ad*

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hoc solution to say that in this very case a governing relation is not established between V_2 and V_3, but between V_2 and C_2 and V_3 would remain empty and ungoverned. This does not solve the mystery of *ranta* ~ *rannan*.

So, (75) might not be the correct representation of the genitive of *ranta* or (74) the correct representation of sonorant-obstruent clusters in general. What if we propose that the structure of sonorant-obstruent clusters looks like the following configuration?

(76)   ...   C   V   C   ...
              | ╱ |
              N   C

This of course seems to be just as much of an *ad hoc* solution as postulating exceptional governing relations in *rannan*. It could be argued that saving our analysis of CG is the only *raison d'être* for the representation in (76).[24] There is, however, independent evidence to support our claim.

Hakulinen (1957: 10–11) and Holman (1975: 60) mention that in a word such as *ilma* 'air' the *l* is clearly longer than in *lima* 'slime'. Adopting the representational format of (76), this is exactly what we should expect. The two words are contrasted in the following display.

(77)   a. C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3
                                    | ╱ | |
                                    i   l   m   a

       b. C_0 V_0 C_1 V_1 C_2 V_2
                            | | | |
                            l   i   m   a

A number of comments are in order here. Firstly, the argumentation given does not amount to retreating to phonetics in order to explain phonological behaviour. Rather, it can be seen the other way round: the representation arrived at by examining phonological processes additionally explains certain phonetic facts. Secondly, a representation where a segment is linked to both a consonantal *and*

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[24] Yoshida (1990) suggests that the so-called mora nasal of Japanese is linked to a vocalic position. It is not simultaneously linked to a consonantal position, though. Accordingly, its realisation is [ũ]. A similar proposal comes from Charette (1991: 219, footnote 1; 220, footnote 11).

a vocalic position might be highly suspicious. Recall, however, that we are not dealing with atomic segments but smaller building blocks, *i.e.* elements. The element I shared by a nucleus and an onset is responsible for palatalisation of consonants followed by high front vowels. A similar effect could be seen for the element responsible for nasality.[25] Thirdly, note that we do not have to assume a representation as in (77a) in order to render the structure grammatical. The association line between between *l* and V_2 is not at all necessary to save V_2 from being empty. If it were in fact completely empty, government from V_3 would come to its rescue.

(78) C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3
                                    | | | |
                                    i   l   m   a
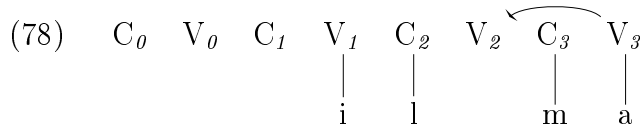
There is, however, evidence for discarding (78) and sticking with (77a). In a word like *helppo* 'easy' we face the problem of two consecutive empty nuclei. A sonorant followed by a geminate is not at all unusual in Finnish.[26] Consider the representation in (79).

(79)   * C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3 C_4 V_4
                                  | | | |
                                  h   e   l   p   o
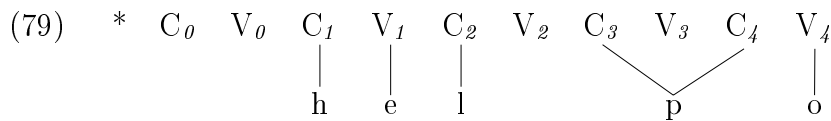
Now, how can we account for this structure? V_3 is not problematic, as it is enclosed in a geminate structure.[27] V_2, on the other hand, does pose a problem, since V_3 does not qualify as a governor (it is empty and silent) and the next filled nucleus (V_4) is too far away. (Recall that government is strictly local, *i.e.* it cannot skip like positions.) Since the structure *is* grammatical, the position must be somehow filled. If we accept that liquids and nasals can spread into vocalic positions, our problem disappears.

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[25] For a fuller discussion of melodic aspects of Finnish *cf.* chapter 6.

[26] Essentially the same structure seems to occur in Japanese. There, however, it is restricted to nasal plus geminate (Yoshida 1990). Recall that Yoshida argues that the nasal occupies a vocalic position only, *cf.* footnote 24 on page 64.

[27] In section 5.3.3 we will see that no governing relation is to be assumed between V_4 and V_3. V_3 can remain empty and unpronounced by virtue of being sandwiched in the geminate, *cf.* Kaye (1995: 295; 329, footnote 11).

(80) C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3 C_4 V_4

| | | | |
h   e   l   p   o
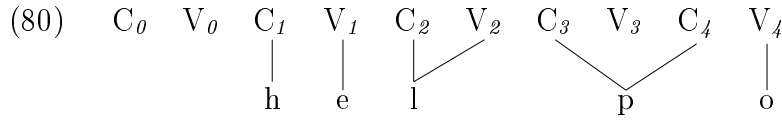
Here, V_2 is filled by the l and therefore the whole structure is grammatical. Note that it is absolutely necessary for the sonorant to occupy both C_2 **and** V_2 in order to prevent a violation of the ECP. Since V_3 is empty, it is unable to govern V_2, therefore the position has to be identified by something else. This is achieved by spreading the sonorant into the vocalic position.

Another objection comes to mind. If sonorants are associated to both a consonantal and a vocalic position, then why are they not realised as syllabic sonorants? The answer seems to be easy. Non-initial syllabic sonorants always occur after a consonant as in the English words *fatal* [ˈfeɪtl̩] or *cycle* [ˈsaɪkl̩].[28] The l in *helppo*, however, occurs after a full-blown vowel. In other words, the same configuration is realised in different ways depending on what the preceding material looks like.

Before we return to the alternation between *ranta* and *rannan*, let us adduce another piece of evidence. Szigetvári (1999: 72ff) suggests that empty nuclei sandwiched within sonorant-obstruent clusters are licit by virtue of being included in a so-called "burial domain" created by government between the obstruent and the sonorant. We might well be dealing with a case of government, considering that Finnish has the usual constraints on homorganicity at least in nasal-obstruent clusters, *i.e.* we find *mp*, *nt* and the like, but not **np*, *mt* etc. This would prove our case — the intervening nucleus is sandwiched in a governing relation and therefore inaccessible for government from outside. With this in mind, we can now return to *ranta ~ rannan*. The correct representation of *rannan* is given in (81).

(81) C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3 C_4 V_4

| | | | |
r   a   n   t   a   n

?
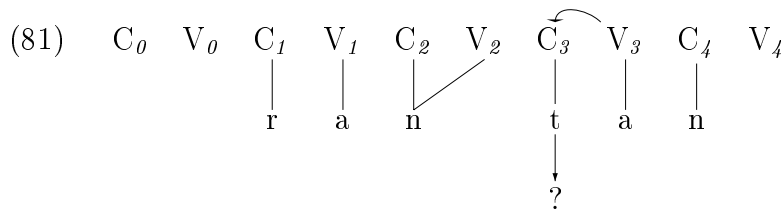
C_3 is hit by government and has to gradate. Since V_4 is empty, nothing can stop V_3 from attacking its own onset. The exact nature of the change will be

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[28] Evidence for an empty nuclear position between t and l or k and l comes from the alternative realisations [ˈfeɪtəl] and [ˈsaɪkəl]. In English, syllabic sonorants seem to be restricted to domain-final position. However, Szigetvári (1999: 111ff) adduces arguments for structural similarities between "branching" onsets and a sequence of stop plus syllabic sonorant.
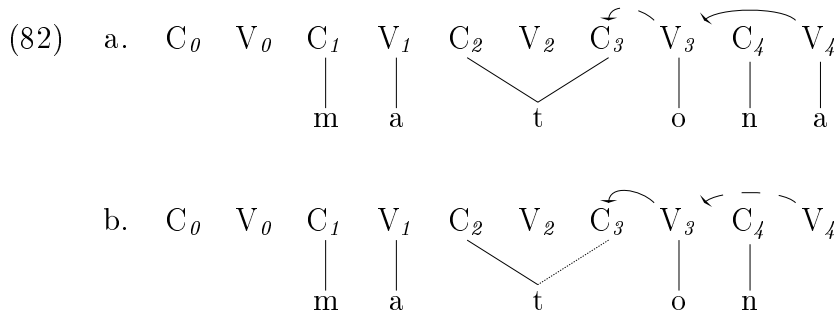
discussed in the next chapter, so in (81) the result of gradation is provisionally indicated by a question mark.

Considering our discussion of sonorant-obstruent clusters, one might object that the final nasal attached to C_4 might also be linked to V_4. This might well be the case. Note that this shows us that even though sonorants in Finnish are allowed to spread into vocalic positions, they are not allowed to act as governors. This might be due to their status as being doubly linked; they still exhibit more consonant-like properties. In fact, this is an additional aspect which we have to state in any case, otherwise no syllable closed by a sonorant would ever undergo gradation. It also tells us why we should not assume that sonorants in Finnish are linked to vocalic positions only.[29] This restriction holds for any position in the word, both finally (*ranna-n*) as well as medially (*luke-a* 'to read' but *lue-nto* 'lecture').

Summing up, we can conclude that nuclei in sonorant-obstruent clusters are inaccessible for government. Under this assumption CG falls out quite naturally. Let us now turn to geminate structures.

5.3.3 Geminates

After the analysis of sonorant-obstruent clusters, an account of the behaviour of geminates seems to be rather simple. Let us consider the two forms of the word *matto* 'carpet': *matto-na* (Ess. Sg.) and *mato-n* (Gen. Sg.).

(82) a. C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3 C_4 V_4

  m   a   t   o   n   a

b. C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3 C_4 V_4

  m   a   t   o   n

Under the assumption that geminates include an empty nucleus which is licensed by virtue of its position and does not have to be taken care of by government, CG falls out quite naturally. In (82a) V_4 governs V_3, which therefore loses its ability to govern (indicated by the broken arrow). C_3 is safe from negative

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[29] Besides which, there is no clue in the signal indicating that sonorants should be exclusively linked to nuclear positions. Finnish *n* is realised as [n], not as [ɯ̃] as in Japanese, *cf.* footnote 24 on page 64.

external influence, *i.e.* government, and the geminate remains intact. (82b) is different. Here there is no way to stop V_3 from exercising its destructive power over C_3. As a consequence, the geminate stop degeminates (indicated by the broken association line).[30] We will return to the exact details as regards melody in the next chapter.

Let us turn our attention to the nucleus contained within the geminate. In order for the presented analysis to work out it is crucial that this nucleus does not contract any kind of governing relation with subsequent nuclear positions. As we will see in section 8.1, this is what sets geminates (*matto*) and obstruent clusters (*e.g. matka* 'journey') apart. While the former readily undergo CG, the latter are notoriously resistant to it (genitives *mato-n* and *matka-n*, respectively). A closer analysis of this inequality will show that the status of the enclosed nucleus is responsible for it. Again, we can assume that a governing relation holds between the two members of a geminate which makes the intervening nucleus inaccessible.

Another troubling issue seems to be the distribution of geminates; they do not occur in word-final position, thus *matto* but *matt. It might be tempting to attribute this to the empty nucleus straddled by the geminate. We could say that *matto* is grammatical because the empty nucleus is governed by the final *o* and that *matt fails miserably because there is no governor for the empty nucleus enclosed in *tt* (assuming that word-final empty positions are not allowed to govern). If this is the approach we take, our analysis of CG collapses (at least the analysis of quantitative CG). Note, however, that we do not yet suffer a defeat. It might well be the case that *matt is ungrammatical because its head (the rightmost part) is not licensed; after all, the nuclear position following it is empty. On the other hand, *matto* qualifies as a Finnish word since the geminate is licensed by the *o*.

Still, the theoretical status of these empty nuclei is somehow questionable. The assumption that they can be licensed by virtue of being included in geminates does not follow from anything. It is a mere stipulation.[31] Clearly, we would prefer a solution where the governing and licensing relations in such a special situation derive from some other principle in the grammar. To that end more research on the behaviour of geminates (or phonological length in general) is required.[32]

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[30] Not surprisingly, Finnish obeys the principle of geminate integrity, which states that geminates can degeminate as a result of lenition but not split up into two different objects (Hayes 1986; Kirchner 2000; Schein & Steriade 1986). Thus we get alternations like $pp \sim p$ but not $pp \sim$ *pv or $pp \sim$ *vp.

[31] Nevertheless, it is also used by Kaye (1995: 295; 329, footnote 11), *cf.* footnote 27 on page 65.

[32] One might object that using the branching constituents of Standard GP we do not face such a problem, because geminates could be represented as a melodic expression simultaneously linked to an onset and a post-nuclear (rhymal) position. Therefore there would be no intervening empty nucleus. This is a viable solution for the case of *matto*, but not for *helppo* 'easy'. For reasons outlined in section 2.1.2 there can be only *one* post-nuclear position

Note that the licensed status of sandwiched nuclei does not mean that they qualify for any other task. Being empty they can hardly be assumed to be governors (*cf.* the discussion of the word *helppo* in the previous section).

Now that the core cases of CG have been discussed, let us turn to alternations which are a bit more special.

5.3.4   Special cases

The remaining cases are special insofar, as they are restricted to a small class of words. This is due to the fact that these alternations impose additional conditions on the surrounding segments. Since considerations of the melody contained in the segments are important here, one might reasonably object that the remaining cases should rather be treated in chapter 6. In fact, we will come back to this issue there as well, but let us stick us with these special cases for the moment, in order to make sure that the *structural* conditions are in fact no different from the ones in the alternations we have tackled so far.

We will first take a closer look at the alternation $k \sim v$ between high rounded vowels as in *luku* $\sim$ *luvun* 'number Nom./Gen. Sg.' or *kyky* $\sim$ *kyvyn* 'ability Nom./Gen. Sg.'. The alternation is lexicalised in so far as it only affects a small group of nouns.[33] Nevertheless, the distribution of grades is exactly the same as what we have seen in the previous cases.

(83) C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3
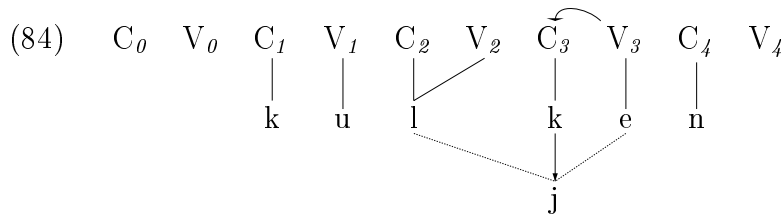
l   u   k   u   n

v
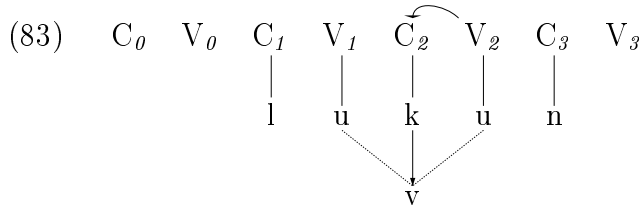
As can be seen from (83), lenition proceeds in the usual fashion. In addition to that, however, the element U contained in both of the surrounding segments spreads onto the gradation site (indicated by dotted lines), changing the result of CG to v. Since in all the words undergoing this very special kind of alternation the segments on *both* sides of the gradating consonant have to be rounded, we

which can either host l or the first half of the geminate *pp*, not both. In other words, if we do not want to say that there are two kinds of geminates in Finnish, one with and the other one without an enclosed nuclear position, we are forced to assume that all geminates contain an empty V position. Finnish "syllable" structure is thus strictly CV.

[33] These are: *luku* and *kyky* as well as *puku* $\sim$ *puvun* 'suit Nom./Gen. Sg.', *suku* $\sim$ *suvun* 'gender, kin Nom./Gen. Sg.', *myky* $\sim$ *myvyn* 'lump, nugget, dumpling Nom./Gen. Sg.' (Fromm 1982: 50).

can assume that spreading has to take place from both sides. In fact, this turns out to be a necessary requirement, considering that the noun *tuki* 'support' has the genitive *tuen*, not **tuven*. Even though the vowel preceding the gradation site is rounded, no spreading occurs.

The alternations we encounter in *sulkea ∼ suljen* 'to shut ∼ I shut', *särkeä ∼ särjen* 'to break ∼ I break' and *rohkenen ∼ rohjeta* 'I dare ∼ to dare' are very similar. Consider the representation of *kuljen*.[34] (The dotted lines indicate spreading of a *single* element, not of the whole expression.)

$$(84) \quad C_0 \quad V_0 \quad C_1 \quad V_1 \quad C_2 \quad V_2 \quad C_3 \quad V_3 \quad C_4 \quad V_4$$

$$k \quad u \quad l \qquad k \quad e \quad n$$

$$j$$

V_3 governs C_3 and gradation ensues. As (84) suggests, spreading occurs from both sides again. We can assume that the element I, which is responsible for j, is contained both in l and e.[35] Note furthermore that not any front vowel following the gradation site will do. A word like *härkä* 'bull' has the correct genitive *härän*, not **härjän*.[36] The alternation $k ∼ j$ only occurs before e and i.

There is one case left; recall (26d), where *rohkenen ∼ rohjeta* 'I dare ∼ to dare' was also given. This alternation seems unclear for several reasons. Firstly, the decisive factor in both *luku ∼ luvun* and *kulkea ∼ kuljen* was that spreading of the elements U and I, respectively, occurred from both sides. However, there is no further evidence to assume that h contains I, as we would expect for $k ∼ j$ to take place. Nevertheless, we might want to say that h contains I for the simple reason that we encounter the alternation $k ∼ j$ after it. Furthermore, this could well tie in with its unusual distribution (pre-consonantal) in Finnish. Secondly, it is interesting to see that there is some fluctuation in the cases involving h. We find *vihkiä ∼ vihin* 'to consecrate ∼ I consecrate' but *rehkiä ∼ rehkin* 'to be troubled ∼ I am troubled' (Fromm 1982: 50–51). Obviously we are dealing with lexicalised forms here.[37] Thirdly, in the case of *rohkenen ∼ rohjeta* there does not seem to

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[34] Recall from section 5.3.2 that pre-consonantal sonorants are linked to consonantal and vocalic positions.

[35] More details about the internal structure of phonological expressions will be given in the next chapter.

[36] At least not in the standard language.

[37] In the cluster *ht* CG always takes place, thus *lahti ∼ lahden* 'bay'. This alternation is of later origin (Fromm 1982: 51).

be any reason why gradation should take place at all. Consider the representation in the following diagram. (Again, the dotted line indicates spreading of a single element.)

$$(85) \quad * \quad C_0 \quad V_0 \quad C_1 \quad V_1 \quad C_2 \quad V_2 \quad C_3 \quad V_3 \quad C_4 \quad V_4$$

r o h k e t a

j
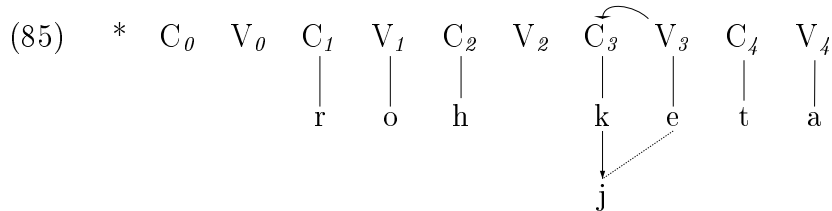
There is no reason why V_4 should not govern the preceding nucleus V_3, depriving it of its own governing capacity. C_3 should therefore be safe from being targeted by its attendant nucleus, yet it appears in the weak grade, as if hit by government.

As will turn out later on, the representation in (85) is *not* correct. Let us just assume for the moment that there is a natural solution to our dilemma. The issue will be taken up again in 8.2, where arguments why gradation takes place will be given. Before we consider this case, however, it will be necessary to have a closer look at the internal structure of phonological expressions and the role of morphology.

Chapter 6

Melody

So far we have only dealt with structural aspects of Finnish CG. The melodic aspects of the segments taking part in the process still remain to be tackled. In what follows we will keep to the Revised Theory of Elements as presented in section 2.2, which will allow us to capture CG in a very economical way.

In order to determine what is actually going on when CG takes place, let us first have a closer look at the internal structure of Finnish consonants. (86) gives an overview of the native (consonant) phonemes and their composition.

(86) | | | | | | |
|---|---|---|---|---|---|
| p | (ʔ, U̱) | t | (ʔ, A̱) | k | (ʔ, ▁) |
| m | (L, U̱) | n | (L, A̱) | /ŋ/ | (L, ▁) |
| v | (U̱) | s | (H, A̱) | h | (H̱) |
| l | (I, U, A̱) | r | (I, A̱) | j | (I̱) |

Plosives consist of a head which is responsible for the place of articulation and an operator indicating that they involve a complete occlusion of the vocal tract.[1] The element ʔ is not included in the representation of any of the sonorants. This is in stark contrast to Kaye (2000) who assumes ʔ for the nasals and for *l*. In the present analysis, where nasals and liquids are allowed to spread into vocalic positions (*cf.* section 5.3.2), such an assumption seems untenable. The element ʔ is restricted to consonantal positions; it is thus questionable why any expression containing it should be found in vocalic positions.[2] The nasals contain

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[1] Gibb (1992: 108) claims that the stops are aspirated and therefore includes the element H. This is not correct. Finnish has plain plosives without *any* aspiration. There is no evidence (neither phonetic nor phonological) that would suggest that H should be included in the representations.

[2] The element ʔ as such is rather questionable in several respects. Its restriction to consonantal positions is a conspicuous feature, setting it apart from all the other elements, which can

a specification for the place of articulation as well as the element L, which is responsible for nasality (Ploch 1999). The representation of *v*, *s*, *h* and *j* is rather straightforward.[3] As regards *r* and *l*, a comment is in order. The special alternations we examined in section 5.3.4 suggested that the element I should be included in both of them. Representing *r* as (I, <u>A</u>) is also a convenient way of setting it apart from *d*, as we will see shortly. The presence of both I and U in *l* accounts for its realisation, which, according to Fromm (1982: 33) is in between palatal and velar. Note that the chart in (86) does not include *d*. As we have seen in the course of our analysis, its occurence in native words can be inferred from the structure of the phonological string. It is always the result of gradation, understood both as a dynamic regularity (*katu* ~ *kadun* 'street NOM./GEN. SG.', *sade* ~ *sateen* 'rain NOM./GEN. SG.') and as a restriction on static distribution (*odottaa* 'to wait', *kahdeksan* 'eight'). The *d* we find in loans and slang expressions on the other hand will have to be dealt with in a different fashion.

Let us now consider peripheral phonemes as in loans like *demokraattinen* 'democratic', *banaani* 'banana', *geeni* 'gene', *fakta* 'fact' and *šakki* 'chess'. These are to be represented as follows.

(87)   *b*   (U, ʔ, <u>L</u>)   *f*   (U, <u>H</u>)
        d   (A, ʔ, <u>L</u>)   *š*   (I, A, <u>H</u>)
        g   (ʔ, <u>L</u>)

In other words, the distributional facts about native and foreign *d* (*cf.* section 3.1.1) are taken as evidence that different representations have to be set up.

From (86) and (87) it can be seen which formal properties a segment must possess in order to undergo CG. As concerns native phonemes, the stops *p*, *t*, *k* are the only expressions which contain the element ʔ in their operator position and thus form a natural class. This is the reason why they are targeted by CG, to the exclusion of all other consonants. However, a slight modification has to be made in order to incorporate phonemes of foreign origin. The segment undergoing CG must not be headed by L. CG itself, then, is nothing but the loss of ʔ. The resulting alternations of simple stops are given in (88).

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occur freely in any position. Attempts have been made to get rid of this unruly element, *cf.* Jensen (1994) and Rennison (1996). We will return to this issue. Further arguments for why nasals and liquids should not contain ʔ are given in the discussion of the gradation of homorganic nasal-obstruent clusters later on. Neubarth & Rennison (in press) explicitly argue for omitting a stop element from nasals.

[3] It might be a bit surprising to find that (<u>U</u>) is realised as [v] and not as [w]. From the cognitive point of view of GP, however, such a minor phonetic detail does not play much of a role.

(88) $p \sim v$ (?, U̲) $\sim$ (U̲)
        $t \sim d$ (?, A̲) $\sim$ (A̲)
        $k \sim \emptyset$ (?, _) $\sim$ (_)

Gradation of p leaves us with a single U element. In Finnish, this is interpreted as [v]. In the case of $t \sim d$ all that remains is an A element. In other words, we would not expect a stop like d. However, there is evidence to justify the representation (A̲), since d is often realised as a tap, [ɾ], not as a fully-fledged stop. (A̲) would therefore seem to be the appropriate representation. Still it is distinct from r, which is (I, A̲) phonologically. With k, CG has a particularly devastating effect. All that is left is an empty head, which accounts for the weak grade simply being zero.

In the special cases of the type $luku \sim luvun$ 'number Nom./Gen. Sg.' or $kulkea \sim kuljen$ 'to go $\sim$ I go' additional adjustments have to be made. In order to understand them, we will first have to investigate the internal structure of vowels (Gibb 1992: 114–115; (Kaye 2000: 114–115) 2000: 3).[4]

(89) i (I̲) y (I, U̲) u (U̲)
        e (A, I̲) $ö$ (I, A, U̲) o (A, U̲)
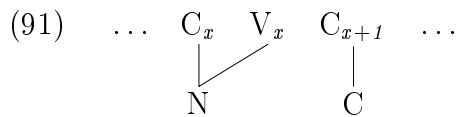 $ä$ (I, A̲) a (A̲)

The alternation $k \sim v$ is restricted to inputs where both surrounding vowels have U as their head and do not contain A. Gradation of k is accompanied by spreading of the U heads of the surrounding segments. The conditions for $k \sim j$ are slightly different. The following vowel must have I as the head (y, $ö$ or $ä$ are not sufficient to trigger the process) and the preceding sonorant must contain I (in the operator position), $cf.$ (86).

Let us now apply this to plosives following a sonorant consonant. In alternations like $nt \sim nn$ we have seen that being in the weak grade entails total assimilation. The alternations in terms of segmental composition (disregarding length) are given in (90).

(90) $mp \sim mm$ (L, U̲) (?, U̲) $\sim$ (L, U̲)
        $nt \sim nn$ (L, A̲) (?, A̲) $\sim$ (L, A̲)
        $nk \sim$ [ŋː]   (L, _) (?, _) $\sim$ (L, _)
        $rt \sim rr$ (I, A̲) (?, A̲) $\sim$ (I, A̲)
        $lt \sim ll$ (I, U, A̲) (?, A̲) $\sim$ (I, U, A̲)

_____

[4] Evidence for the given representations comes from vowel harmony which we will not be able to discuss here.

Considering the condition on homorganicity, we can assume that the clusters share their head. The alternations then consist of getting rid of ʔ and spreading the remaining elements from the sonorant position to the former plosive position. Here we are presented with further evidence against including ʔ in the representation of nasals or *l*. The weak grade of a cluster like *nt* is *nn*, *i.e.* all elements of the nasal spread to the second position. This would include ʔ. If CG prevents ʔ from occuring in a governed position, then why should that very position be filled by the offending element again?

There is, however, yet another problem associated with these clusters. In section 5.3.2 we argued that sonorants are allowed to spread into vocalic positions, yielding the following structure, which is but a (slightly modified) repetition of (76).

(91)   ... C_x V_x C_{x+1} ...

                 N   C

This raises the question of what exactly happens to C_{x+1} when it is governed. It is targeted by spreading but does that mean the nasal is then linked to all three positions, C_x, V_x and C_{x+1}? If yes, could there be a contrast to nasals which are linked to two consonantal positions only? In order to avoid these problems, we could assume that as a result of CG the nasal delinks from V_x and attaches to C_{x+1} instead. This creates an "ordinary" geminate. Note, however, that nothing changes as regards the status of V_x. It was and still is inaccessible. In other words, the resulting structure looks as follows.[5]

(92)   ... C_x V_x C_{x+1} ...

                 N   C

This leads us directly to the discussion of geminates. (93) gives the alternations in terms of segmental composition (again disregarding length).

(93) $pp \sim p$ (ʔ, U̲) (ʔ, U̲) $\sim$ (ʔ, U̲)
        $tt \sim t$ (ʔ, A̲) (ʔ, A̲) $\sim$ (ʔ, A̲)
        $kk \sim k$ (ʔ, _) (ʔ, _) $\sim$ (ʔ, _)

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[5] We have to admit that delinking is in fact a serious problem. However, it is not crucial to the present analysis whether the nasal is delinked from V_x or not, as long as V_x is taken care of.

We can assume that all the elements of a plosive are linked to both skeletal slots. Deleting ʔ from the second position obviously entails loss of all the remaining melody, *i.e.* we end up with a single plosive, not something like *pv.[6] This means the structure has to be like in (94), where α represents any plosive, β any vowel.

$$(94) \quad \ldots \quad C_x \quad V_x \quad C_{x+1} \quad V_{x+1} \quad \ldots$$
$$\qquad\qquad\quad | \qquad\qquad\qquad\quad |$$
$$\qquad\qquad\quad \alpha \qquad\qquad\qquad\quad \beta$$

What is the status of V_x? Degemination being a result of CG, the formerly sandwiched nuclear position loses its favoured status. We would expect V_{x+1} to govern V_x, but V_{x+1} already governs C_{x+1}, so it does not qualify as a governor for the preceding nuclear position. We are in fact in a dilemma.

This ties in with the generally questionable status of the element ʔ. Recall from footnote 2 on page 72 that it is the only element which is restricted to consonantal positions. It is the odd one out and attempts have been made to eliminate it from the theory. However, ʔ turns out to be a rather unruly element and every attempt to get rid of it has to face a number of problems. Let us consider some of the proposals in more detail but bear in mind that any solution we will arrive at will be quite sketchy in nature for the time being.

Analysing data from Sesotho and Irish, Jensen (1994: 74) argues that "fortis stops are actually no different from true phonological geminates". In other words, every time we encounter a stop we are actually faced with the following structure.

$$(95) \quad \ldots \quad C_x \quad V_x \quad C_{x+1} \quad \ldots$$
$$\qquad\qquad\qquad\qquad\qquad |$$
$$\qquad\qquad\qquad\qquad\qquad \alpha$$

The melody is attached to C_{x+1} which governs the preceding empty consonantal position C_x. Such a configuration is realised as a simple stop. Even though Jensen never mentions it, we can assume that a geminate is represented as such, *i.e.* as a melodic expression associated to two consonantal slots. It is clear that the consequences of such an approach are quite far-reaching; phonological representations would look radically different if every simple stop took up the space of a full-blown geminate. For reasons of space we will not pursue this theory any further here.

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[6] Obeying geminate integrity, *cf.* footnote 30 on page 68.

Rennison (1996) proposes that C and V positions have inherent melodic content, whose realisation is mediated through a so-called "empty element". Occlusion is no longer a property contributed by an autonomous element but rather hard-wired in the skeletal position C. It is realised whenever the empty element is present in an appropriate configuration. A similar argument, albeit in a much less specific way, is put forth in Szigetvári (1999: 61–62), part of which was already given in (51).

(96)   C positions host segments with consonantal properties and V positions host segments with vocalic properties, or rather, these positions add consonantal and vocalic properties, respectively, to segments they host. [...]
Vocalicness is loud, not only acoustically but also in the sense that V slots in the phonological skeleton aim at being pronounced. As opposed to this, consonantalness is mute, if nothing intervenes a C position will stay silent.

In other words, the consonantal position as such would be the ideal candidate to take over the tasks of the element ʔ which acoustically "manifests itself as an abrupt and sustained drop in overall amplitude" (Harris & Lindsey 1995: 69). However, this immediately raises the question of how to account for differences in manner. Both plosives and fricatives are associated to C positions. If the specification of occlusion is an integral part of the skeletal slot, then how can these differences be captured? Szigetvári (1999: 166) advances the following solution.

(97)   In the present framework it seems evident that the divergent consonantal properties of segments could be attributed to the different statuses a C position on the skeleton can find itself in. Recall, a C can be licensed and ungoverned, licensed and governed, unlicensed and ungoverned and unlicensed and governed. What remains to be encoded by subskeletal melodic primes is the place of articulation and the laryngeal properties [...] of sounds, both of which are encountered in consonants and vowels alike.
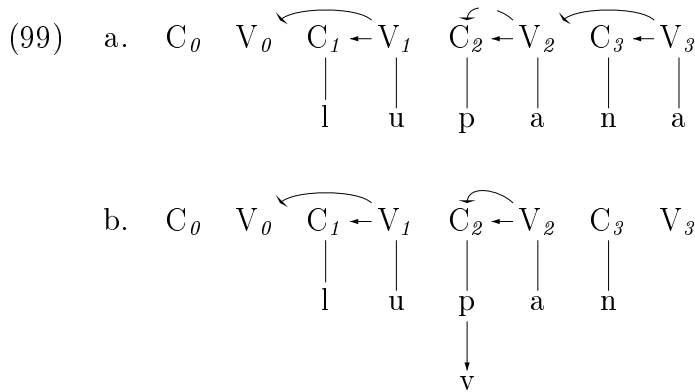
Such an approach is in fact rather common considering what the concept of government is usually used for in Government Phonology. Let us return to the facts from Moroccan Arabic (Kaye, Lowenstamm & Vergnaud 1989) presented in (42) and repeated here as (98) for the sake of convenience.

(98)   *tan ktib* 'I write'   *tan kitbuː* 'we write'

What surfaces as [ɨ] is nothing but the realisation of an unlicensed empty nucleus. Both [ɨ] and zero are the same as regards their segmental make-up, the only difference is in the relationships between the skeletal positions. Applying similar reasoning to consonantal positions might not only rid the theory of an undesired element, it also streamlines the set of relations between skeletal positions.

Let uns now see how this can be of use for the analysis of Finnish. The analysis of structural aspects in chapter 5 has shown that in all cases the gradation site is a consonantal position which is licensed by its nucleus but at the same time hit by government. Despite the different outcomes of gradation — simple *t* is lenited to *d* but *nt* to *nn* and *not* to **nd* — we might have become suspicious of this seeming diversity. Since CG is always[7] triggered in the same environment, we should be justified in assuming that we are dealing with a *uniform* phenomenon. Still, we have to face shortening of geminates in one case, spirantisation in another, complete loss in yet a third, and so on.

The solution offering itself at this stage seems to be rather radical.[8] In the examples from Morocan Arabic we saw that the absence of government enforced the realisation of the *minimal filling* of the nucleus, the phonetic outcome being [ɨ].[9] Governed positions, on the other hand, remain silent. Nuclei aim at being pronounced (Szigetvári 1999: 62), but government spoils this inherent property and thus silences the vocalic position. This can be related to consonantal cases, where we should expect the minimal filling to be something like occlusion. Exactly as in the case of vowels, government is able to exhibit its suppressive force on consonants as well. Consider the forms in (99), illustrating the alternation $p \sim v$ in *lupana* $\sim$ *luvan* 'permission Ess./Gen. Sg.'.

(99)   a. C_0 V_0 $C_1 \leftarrow V_1$ $C_2 \leftarrow V_2$ $C_3 \leftarrow V_3$
                                  | | | | | |
                                  l   u   p   a   n   a

       b. C_0 V_0 $C_1 \leftarrow V_1$ $C_2 \leftarrow V_2$ C_3 V_3
                                  | | | | |
                                  l   u   p   a   n
                                                      |
                                                      v

[7] Leaving aside the (few) problematic cases to be discussed in chapter 7.

[8] Bear in mind that it can only be a sketch. Further research will have to show whether it constitutes a viable solution for Finnish, let alone for other languages.

[9] The phonetic outcome could well be something else, *e.g.* [ə] or [ɐ]. The concrete realisation differs from language to language.

Arguing along the same lines as in the case of [ɨ] ∼ zero, we could say that there is no difference in the melody of *p* and *v*. All they contain is U. The alternation we see is *entirely* due to governing relations. All that has to be specified in both *p* and *v* is their labiality. On top of the already existing melody the position is equipped with, we also perceive the minimal filling (*i.e.* occlusion), provided the consonant is ungoverned. This yields *p*, a stop.[10]

This approach runs into serious problems right away. If governing relations are the sole reason why a phonological expression surfaces as a stop in one case, but as a fricative in another, we would expect that the relationship between the alternants is biunique. That is to say, *p* should always be the strong grade of *v* and *v* should always be the weak grade of *p*. However, this is not what we find. Imagine we encounter a genitive like *lavan*. We cannot tell from its shape alone whether it comes from *lapa* 'blade, shoulder NOM. SG.' or *lava* 'stage, platform NOM. SG.'. Note that positing two different underlying representations does not get us out of the problem. For the sake of the argument, let us assume that alternating *v* (*lapa* ∼ *lavan*) is to be represented as (U̲), while invariant *v* (*lava* ∼ *lavan*) is (U, _). Now if the absence of government contributes stop-like quality to a consonantal position, it will add this property to *any* consonantal position, no matter what phonological expression is associated to the slot. In other words, in ungoverned position both (U̲) and (U, _) would have to be realised as stops. There is no way out. In fact, we would have to contend with a further embarrassing problem. If occlusion is completly derivable from government, then why is there no alternation in the foreign phonemes *b*, *d*, *g*? The word *lapa* alternates with *lavan*, yet *tuuba* 'tuba' does not alternate; its correct genitive form is *tuuban*.

Let us now review the remaining kinds of CG in order to see whether the problems are restricted to simple plosives. What about sonorant-obstruent clusters? In section 5.3.2 we suggested that the intervening empty nuclear position is inaccessible for any attempts at government, because of the sonorant spreading into it and/or government. Under the assumption that there is government, we could account for the sonorant being a sonorant, and not a stop. This is a promising result (as long as we are talking about oral occlusion). If there were no government, the sonorant should display stop-like properties. This is still a pleasant result in the case of nasals, which involve oral occlusion. However, it is less welcome for the liquids *l* and *r*. Note in passing that the same problem holds for an obstruent-obstruent cluster like *st* in *aisti* 'sense'. The *s* would be ungoverned, yet it is realised as a fricative.

Finally, let us consider the geminates. (100) gives the representation of *pp*.

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[10] Note that we now face an interesting problem in defining whether Finnish CG is a case of lenition. If lenition is the reduction of elements, CG does not qualify. It would be neither fortition nor lenition.

(100)   ... C_x V_x C_{x+1} ...

$$\underset{\text{U}}{\diagdown\diagup}$$

If V_x's inaccessability for government is in fact due to its being included in a governing domain, the first half of the geminate should never be a plosive. It is always governed. The weak grade is even more problematic. As soon as C_{x+1} is governed, it would lose the stop-like properties; we would expect *vv which is not the correct result.

All this means that CG cannot be entirely captured in terms of government. In the current state of affairs there is a huge number of problems to overcome. Further research will show whether there is any possibility to escape this predicament. Here we have to conclude our discussion of melody and move on to morphological issues.

Chapter 7

Morphology

7.1 CG as morphologically conditioned

It has been the aim of this thesis to investigate the workings of CG on a very mechanical level. In other words, we have had a closer look at the interaction of several principles of GP which together automatically determine the distribution of grades in Finnish. So far, only phonology has been invoked to account for this phenomenon.

Several analyses have been put forth which claim that to a greater or lesser extent Finnish CG has been morphologised, *i.e.* it has to have access to morphological information (Hammarberg 1974, Holman 1975, Karlsson 1974abc, 1983, Kiparsky 1993, Skousen 1975). The argumentation for this comes two directions. On the one hand, analyses making use of a more traditional model of phonology fail to capture the relevant regularities which CG consists of. As it turns out, the concept of syllable is more of a burden than an effective tool in handling CG, as we will see in section 8.2. On the other hand, there are analyses which straightforwardly deny the possibility that CG could be anything but morphology. A particularly insistent example of this is Skousen (1975). In this monograph on the necessity of taking external (substantive) evidence into account, Skousen argues that speakers never determine the correct grade by reference to phonological structure, but in fact learn everything by heart.

(101)　　There seems to be a lot of surface evidence in the standard language
that the rules of gradation, whatever they might be, take place
in a short, closed syllable. I will argue, however, that there is no
substantive evidence that speakers ever realize this fact; instead of
postulating a phonetically conditioned environment for gradation,
they memorize what specific suffixal forms take the weak stem and
what suffixes take the strong stem.
(Skousen 1975: 59)

Skousen's claim is based on certain seeming irregularities, most of which we
will have a look at in this chapter.[1] The fact that speakers of Finnish do not elim-
inate these apparent exceptions is seen as evidence that they do not capture the
necessary conditions on the phonological environment. One of Skousen's examples
is the set of possessive suffixes. In section 3.2 we saw that they never trigger CG,
e.g. katu ∼ *kadu-n* 'street NOM./GEN. SG.' but *katu-mme* 'our street NOM. SG.'
in the strong grade. We can safely assume that these cases do not turn out to
be problems for our analysis. They do not constitute exceptions. They just show
that morphological boundaries can have an effect on the phonology, yet that does
not imply that phonological generalisations become instatable. Let us consider
a case from English, taken from Kaye (1995). A word such as *peeped* could not
be monomorphemic for the simple reason that [pt] could not occur before a long
vowel. We can tell from the shape alone that there must be a morphological
boundary between [p] and [t]. The word *kept* on the other hand could perfectly
well be monomorphemic (*cf. apt*), it just happens to be the case that it is not.
It is true that there are fewer (if any) phonotactic restrictions at morphological
boundaries, *cf. parenthood* or *harmless* with their sequences of [th] and [ml], re-
spectively, none of which could occur within a single morpheme. However, that
does not imply that there are no phonotactic restrictions to be stated. The same
holds true for Finnish, and the case of possessive suffixes is an instructive example
in this regard. We will return to this issue in more detail in section 7.3.

Nevertheless, let us dwell on Skousen's proposal for a while. Its consequences
are far-reaching. If it were true in fact that speakers memorise every alternation
without capturing any rules, they would have an enormous task ahead of them.[2]
Memorising the distribution of grades without referring to phonological structure

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[1]　Skousen also adduces dialectal evidence. Reasons of space preclude discussion of these as-
pects. However, none of his arguments constitute a fatal threat to our analysis.

[2]　Skousen (1975) does not claim that speakers could not discover any regularities whatso-
ever. They are clearly in a position to relate strong and weak grades to each other, *i.e.*
they understand the connection between *pp* and *p* and the like. Skousen argues that the
speakers are not able to predict the distribution of *pp* or *p* on the basis of the phonological
environment. However, this does not explain why we do *not* find alternations like **pp* ∼ *v*
etc.

does not just mean that one has to learn one specific grade per suffix, *e.g.* weak grade before the adessive suffix *-llA* as in *ka<u>t</u>u* 'street' ∼ *ka<u>d</u>u-lla* 'on a street'. Whether a particular suffix triggers gradation or not depends not only on the properties of the suffix but also on those of the stem. CG is only possible in stems ending in a short vowel, while a stem-final long vowel prevents gradation. The suffix, which in principle could trigger CG, is simply too far away: *ta<u>k</u>uu* 'guarantee' ∼ *ta<u>k</u>uu-lla* 'with guarantee; certainly'. In other words, phonological strings are evaluated *as a whole*. The relevant forms are opposed in (102).

(102)   a. C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3 C_4 V_4

                             k   a   t   u   l   a

                                             d

        b. C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3 C_4 V_4 C_5 V_5

                             t   a   k   u   l   a
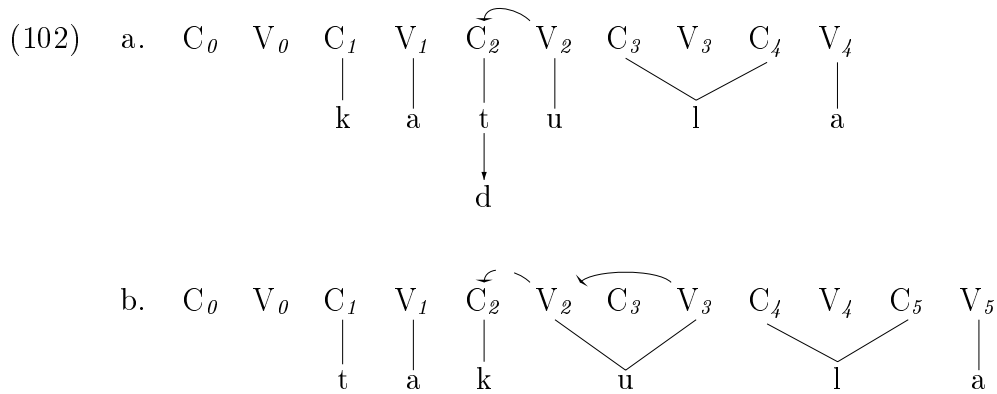
Considering the morphological richness of Finnish with its huge number of inflectional and derivational suffixes and different patterns of stem formation, one can see quite clearly that memorising is by no means a trivial issue. The following charts serve to illustrate this with a part of the inflectional paradigm of nouns.

(103)   a.

	lu<u>p</u>a 'permission'	*kir<u>kk</u>o* 'church'
NOM. SG.	*lu<u>p</u>a*	*kir<u>kk</u>o*
GEN. SG.	*lu<u>v</u>a-n*	*kir<u>k</u>o-n*
PAR. SG.	*lu<u>p</u>a-a*	*kir<u>kk</u>o-a*
ESS. SG.	*lu<u>p</u>a-na*	*kir<u>kk</u>o-na*
ILL. SG.	*lu<u>p</u>a-an*	*kir<u>kk</u>o-on*
ADE. SG.	*lu<u>v</u>a-lla*	*kir<u>k</u>o-lla*

        b.

	hi<u>d</u>as 'slow'	*ra<u>k</u>as* 'dear'
NOM. SG.	*hi<u>d</u>as*	*ra<u>k</u>as*
GEN. SG.	*hi<u>t</u>aa-n*	*ra<u>kk</u>aa-n*
PAR. SG.	*hi<u>d</u>as-ta*	*ra<u>k</u>as-ta*
ESS. SG.	*hi<u>t</u>aa-na*	*ra<u>kk</u>aa-na*
ILL. SG.	*hi<u>t</u>aa-seen*	*ra<u>kk</u>aa-seen*
ADE. SG.	*hi<u>t</u>aa-lla*	*ra<u>kk</u>aa-lla*

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c.		*takuu* 'guarantee'	*hakkuu* 'felling, logging'
	NOM. SG.	*takuu*	*hakkuu*
	GEN. SG.	*takuu-n*	*hakkuu-n*
	PAR. SG.	*takuu-ta*	*hakkuu-ta*
	ESS. SG.	*takuu-na*	*hakkuu-na*
	ILL. SG.	*takuu-seen*	*hakkuu-seen*
	ADE. SG.	*takuu-lla*	*hakkuu-lla*

From the phonological point of view of the analysis outlined in this thesis nothing has to be said about these forms. The weak grade occurs whenever the next but one nucleus after the gradation site is empty, otherwise we find the strong grade. This is a clear and regular pattern. What has to be specified, though, is that different nouns use different stems for the formation of the individual entries of the paradigm. A noun like *lupa* 'permission' retains the same stem (the so-called "vowel stem") throughout the whole paradigm. This can be contrasted with the adjective *hidas* 'slow', where the vowel stem is used for all forms except for nominative and partitive. This is clearly a morphological issue, yet it stands in no causal relationship with CG. Morphology does not condition CG as such, it only determines which stem has to be used. Comparing *lupa* 'permission' and *takuu* 'guarantuee' we can observe another interesting facet. Weak and strong grade, respectively, are not properties connected with a certain affix. If such were the case, the genitive -*n* should always trigger CG. However, this is not what happens. In the genitive form *takuu-n* 'guarantuee GEN. SG.' the plosive is too far away to be affected. This is not a morphological problem, either. It follows directly from the workings of CG. All this is by no means characteristic of nominal inflection only. The same applies to verbal morphology, as the examples in (104) serve to illustrate.

(104)	a.	INF.	*huuta-a* 'to shout'	*otta-a* 'to take'
		1st SG.	*huuda-n*	*ota-n*
		2nd SG.	*huuda-t*	*ota-t*
		3rd SG.	*huuta-a*	*otta-a*
		1st PL.	*huuda-mme*	*ota-mme*
		2nd PL.	*huuda-tte*	*ota-tte*
		3rd PL.	*huuta-vat*	*otta-vat*

b.

INF.	*taata* 'to guarantee'	*ha__k__ata* 'to fell, to hack'
1st SG.	*ta__k__aa-n*	*ha__kk__aa-n*
2nd SG.	*ta__k__aa-t*	*ha__kk__aa-t*
3rd SG.	*ta__k__aa*	*ha__kk__aa*
1st PL.	*ta__k__aa-mme*	*ha__kk__aa-mme*
2nd PL.	*ta__k__aa-tte*	*ha__kk__aa-tte*
3rd PL.	*ta__k__aa-vat*	*ha__kk__aa-vat*

We encounter the same pattern as in nominal inflection. In all forms CG works exactly as expected.[3] Again, a stem-final long vowel blocks CG, which is a question of phonological locality, not of morphology. If we do not acknowledge these regularities, we are forced to set up tables like the following, where "w" stands for "weak grade", "s" for "strong grade".

(105) a.

type	NOM. SG.	GEN. SG.	PAR. SG.	ESS. SG.	ILL. SG.	ADE. SG.
lupa	s	w	s	s	s	w
hidas	w	s	w	s	s	s
takuu	s	s	s	s	s	s

b.

type	1st SG.	2nd SG.	3rd SG.	1st PL.	2nd PL.	3rd PL.
huutaa	w	w	s	w	w	s
taata	s	s	s	s	s	s

Quite clearly, implicational morphological relationships could be set up to account for the distribution of grades. An example of such a relationship would be "if α grade in the genitive then α grade in the adessive, where $\alpha \in \{$weak, strong$\}$" (*kadu-n* → *kadu-lla*, *hitaa-n* → *hitaa-lla*, *takuu-n* → *takuu-lla*). The remarks set forth here are not to say that speakers could not deal with CG in a morphological fashion at all. They are just meant to show that such an approach is extraordinarily complicated in comparison to the rather simple phonological generalisation which GP makes possible. Kiparsky (1975: 193) comes to the same conclusion and states that "[t]he difficulties with the phonological environment [would be] pale in comparison to those that the morphological environment creates."

All this is not to say that CG does not have any function, that it is simply a complicating factor in the grammar of Finnish. CG considerably adds to indexicality (Anttila 1975; Nahkola 1995). It is an important clue for parsing. In other

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[3] The infinitives *taata* 'to guarantee' and *ha__k__ata* 'to fell, to hack' will be discussed in section 8.2. They are perfectly regular.

words, the choice of the grade gives an important clue as to the phonological structure of the following material. Consider the alternation in *kadu-n* ∼ *katu-na* 'street GEN./ESS. SG.' where *d* is a clear indication that the next but one nucleus must be empty. CG creates connections within the phonological string. It is the *signifiant* of governing relations. The canonical structure of Finnish (*cf.* section 5.3.1 and Holman 1975) — typically two "syllables" — means that CG is usually an index for the structure of derivational and inflectional suffixes. However, this does not amount to saying that CG is morphologically conditioned. Originally derived forms, which are synchronically to be seen as simple, still exhibit the same indexical pattern. Consider the word *kahdeksan* 'eight' (originally derived; related to *kaksi* (stem *kahte-*) 'two') where *d* still functions as an index even though *kahdeksan* can hardly be seen as a derived form synchronically. The same holds for *yhdeksän* 'nine'. In other words, CG enforces distributional restrictions similar to constraints on word-initial or word-final material. All these phenomena give important clues for parsing.[4]

7.2 Morphological domains

Let us review a proposal on the interaction between morphology and phonology as set forth in Kaye (1992b, 1995). According to Kaye (1995: 302) "morphological structure has two effects on the phonology: little and none. These two interactions are called *analytic* and *non-analytic*." Recall the English examples from the last section. The word *peeped* gives away its morphological complexity by the mere fact that no long vowel could occur before [pt] in a single morpheme. The structure presents us with a reliable clue on how to process the word in question — there is a morphological boundary between [p] and [t]. This is what we term **analytical**. Contrast this with *kept*, which qualifies as a monomorphemic word of English. It just so happens not to be one. There is no hint that this could be a morphologically complex form. This is **non-analytical** morphology. Summing up, the past tense forms are to be represented in the following way (Kaye 1992b: 142).

(106) a. NON-ANALYTIC [keep + past]
       b. ANALYTIC [[peep] past]

The predictions of such a minimalist model of the interaction between phonology and morphology are clear. Phonological processes should apply whenever their conditions are met (Kaye 1992b, 1995). Only morphological boundaries of

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[4] For the role of parsing in Government Phonology *cf.* Kaye (1989) and Ploch (1996).

the analytic type can interfere and prevent the application of phonology; recall the greater freedom from phonotactic constraints as discussed in the last section.[5]

CG applies within morphemes as well as across non-analytic morphological boundaries. We can thus safely assume that most of Finnish morphology is non-analytic. Consider a verb like *luke-a* 'read', whose stem *luke-* is subject to CG in the past passive participle *lue-ttu* 'read'. This suffix is itself gradated in the genitive *lue-tu-n*.[6] All these morphological boundaries are invisible to phonology. CG applies across them as if they did not exist.

7.3 Possessive suffixes

The behaviour of the possessive suffixes is in many respects inconsistent with the forms we have seen so far. Clearly, the morphological status of theses suffixes is the crucial factor here. We will see that by making use of the notion of analytic morphology we are in position to gain some interesting insights.

Harrikari (1999b) contains a survey of the problems. We will have a closer look at the data she presents and see how they fit our analysis. Consider first the examples in (107a), where the possessive suffixes are given both in isolation and affixed to a nominative form. Contrasting them with the controls in (107b), whose structures have been accounted for in the course of this thesis, we see where the problems lie.

(107)	a.	1. Sg.	*-ni*	*katu-ni*	'my street'
		2. Sg.	*-si*	*katu-si*	'your street'
		3. Sg.	*-nsa, -Vn*	*katu-nsa, *kadu-nsa*	'his/her street'
		1. Pl.	*-mme*	*katu-mme, *kadu-mme*	'our street'
		2. Pl.	*-nne*	*katu-nne, *kadu-nne*	'your street'
		3. Pl.	*-nsa, -Vn*	*katu-nsa, *kadu-nsa*	'their street'

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[5] There is an interesting consequence ensuing from this. Kiparsky (1993) proposes that CG takes place in derived environments only. This allows for an elegant account of why nominatives like *katu* 'street' do not undergo CG — there is no need for them to do so, since they are not derived forms. However, as we will see in section 8.2.1, there are words like *kuningas ∼ kuninkaa-n* 'king Nom./Gen. Sg.' where we encounter the weak grade in the nominative, even though there is no reason to assume that we are dealing with a derived form. It must therefore be considered a virtue of Kaye's model that it has a hard time capturing derived environment effects. Processes apply whenever their conditions are met, regardless of whether the form is derived or not.

[6] Note how the assumption of a CV-skeleton and the notion of structure preservation provide us with a simple and elegent explanation why the gradated *-k-* of the stem does not reappear in *lue-tu-n*, even though the "syllable" seems to be open again now. In the present analysis *-k- should* not reappear, since it still meets the requirement for CG.

b. *katu*   'street Nom. Sg.'
    kadu-n   'of a street Gen. Sg.'
    katu-na   'as a street Ess. Sg.'
    katu-a   '(part) of a street Par. Sg.'
    kadu-lla   'on a street Ade. Sg.'
    kadu-lle   'onto a street All. Sg.'

The forms of the 1st (*katu-ni*) and 2nd person singular (*katu-si*) are not surprising. The structure of the whole word and thus the grade of the stem seem to be parallel to *katu-na* (Ess. Sg.), which was discussed in section 5.3.1. All the other forms, however, are problematic. From (107b) we see that suffixes of the form -*CCV* should trigger CG, as in the case of *kadu-lla* 'on the street'. With possessive suffixes, however, no gradation is to be observed, even though the structural conditions are be satisfied. The contrast is to be seen very clearly in the suffix of the 1st person plural, -*mme*, which is both a possessive suffix and a personal ending in verbs. We thus get *katu-mme* 'our street'[7] but *kadu-mme* 'we repent' (from *katu-a* 'to repent').

What seems to be crucial in the nominative forms in (107a) is the existence of an analytical boundary which establishes domains and delimits the phonological site processes can operate on. The relevant representations of *katu-mme* 'our street' and *kadu-mme* 'we repent' are given in the following table.

(108)   [*katu-a*] 'to repent'   [*kadu-mme*] 'we repent'
        [*katu-a*] 'street Par. Sg.'   [[*katu*]-*mme*] 'our street Nom. Sg.'

In fact, nothing else has to be said about these forms. By applying phonology in exactly the same way as before, the correct results are obtained. In the case of the verb, both the personal ending -*mme* and the infinitive marker -*a* are added directly to the stem, with no intervening boundary visible to morphology. Phonology comes into force and gradation ensues in the inflected form *kadu-mme*, while the stem remains unchanged in the infinitive *katu-a*. The same holds true for the partitive form *katu-a* '(part) of a street'. Its morphological structure does not play any role for phonology. The situation is quite different in the form marked for possession, *katu-mme*. Here, the stem forms a complete domain, where phonology applies (or does not apply) as if we had the stem on its own. Gradation is prevented for exactly the same reason as in the bare nominative *katu* — the *u* is in domain-final position and thus not able to trigger CG, *cf.* section 5.3.1. Addition of the possessive suffix cannot change the governing

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[7] In fact, *katu-mme* has more interpretations than just 'our street'. More on this shortly.

relations already established within the stem and accordingly we observe no alternation. The crucial governing relations holding within the members of the pair *kadu-mme* vs. *katu-mme* are given in (109a) and (109b), respectively.

(109) a.
$$C_0 \quad V_0 \quad C_1 \quad V_1 \quad C_2 \quad V_2 \quad C_3 \quad V_3 \quad C_4 \quad V_4$$

$$k \qquad a \qquad t \qquad u \qquad\quad m \qquad\qquad e$$

$$d$$

b.
$$C_0 \quad V_0 \quad C_1 \quad V_1 \quad C_2 \quad V_2 \;] \quad C_3 \quad V_3 \quad C_4 \quad V_4$$

$$k \qquad a \qquad t \qquad u \qquad\quad m \qquad\qquad e$$
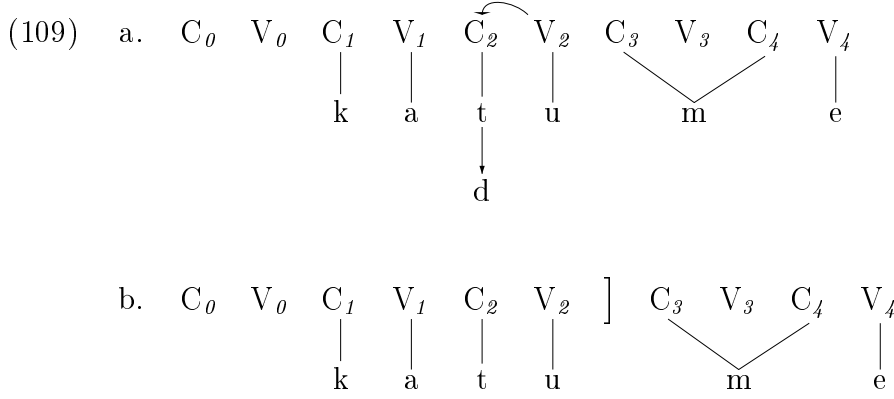
This is not all there is to say about this class of suffixes. As is evident in (110a), final consonants of preceding suffixes seem to get deleted, thus *huonee-seen* 'into a room' as opposed to *huonee-see-si* 'into your room'. This leads to yet another asymmetry. If the inflected form *without* possessive suffix displays the weak grade (*kadu-n*), the strong grade *of the stem* will be restored after the loss of the cases suffix (*katu-ni*), as is exemplified in (110b). On the other hand, no such restoration of the strong grade takes place in case suffixes; therefore both *tavaroi-den* 'of things' and *tavaroi-de-si* 'of your things' in (110c).[8]

(110) a.

stem + case	stem + case + possessive	
huonee-see<u>n</u>	*huonee-see∅̷-si*	'into your room Ill. Sg.'
hattu-i-hi<u>n</u>	*hattu-i-hi∅̷-si*	'into your hats Ill. Pl.'
talo-j-e<u>n</u>	*talo-j-e∅̷-si*	'of your houses Gen. Pl.'

b.

stem	stem + case	stem + case + possessive	
ka<u>t</u>u	*ka<u>du-n</u>*	*ka<u>t</u>u-∅̷-ni*	'of my street Gen. Sg.'
ha<u>tt</u>u	*ha<u>t</u>u-<u>n</u>*	*ha<u>tt</u>u-∅̷-ni*	'of my hat Gen. Sg.'

c.

stem + case	stem + case + possessive	
peruno-i-<u>de</u><u>n</u>	*peruno-i-<u>de</u>∅̷-si*	'of your potatoes Gen. Pl.'
tavaro-i-<u>de</u><u>n</u>	*tavaro-i-<u>de</u>∅̷-si*	'of my things Gen. Pl.'

[8] Only the final consonants of *suffixes* are affected. If the noun itself ends in consonant, another stem will be used as the basis for the possessive suffix. Thus *kadu-n* 'street Gen. Sg.' ∼ *katu-∅̷-ni* 'my street Gen. Sg.' but *puhelin* 'phone Nom. Sg.' ∼ *puhelime-ni* 'my phone Nom. Sg.'.

It is somehow misleading to conceive of this deletion as a phonological process. Considering an alternation *kadu-n* ∼ *katu-∅-mme* 'of a/our street Gen. Sg.' one might be tempted to think of cluster simplification (**kadu-n-mme*). However, there is no reason why this should happen in the case of the genitives in the first and the second person singular. If the forms were **kadu-n-ni* or **kadu-n-si*, no phonotactic restriction of Finnish would be violated. We would not expect that these clusters have to be simplified.[9] Thus, we are forced to assume that the irregularity we observe is in fact a morphological property of the forms marked for possession. Forms like *katuni* 'of my street Gen. Sg.' are *not* derived from the regular genitive *kadun* but from the bare stem *katu-* instead. Support for this comes from the nominatives, which are formed from the stem as well, *cf.* footnote 8 on page 89. This is not so clear in a noun like *katu*, where stem and nominative are the same. The word *puhelin* 'phone Nom. Sg.', however, serves to illustrate our point — "my phone" is *puhelime-ni*.

The consequences of such an approach are reassuring. If the forms marked for possession are indeed derived from the stem and if possessive suffixes are analytical in nature, then CG falls out quite naturally. The correct representation of the genitive forms is just as in (109b), *i.e.* exactly the same as for nominatives. What we observe is a complication of the inflectional morphology, yet this leaves CG as a process relatively unaffected. CG does not have to "know" about the morphological status of the suffixes, it is just sensitive to domain boundaries. There is no such thing as a "restoration of the strong grade" or anything similar, for the simple reason that there is nothing to be restored.

An interesting prediction of this is the following: If there is no such thing as cluster simplification then every case suffix ending in a consonant must have at least two allomorphs, one with the final consonant and one without. Such an interpretation of the system might seem quite *ad hoc*. One could argue that non-analytic morphology is used in an arbitrary way to save CG. Note, however, that the distinction of what is analytic and what is non-analytic is generally assumed to be somehow arbitrary. The English suffixes *-ity* and *-ness* fulfill basically the same function, yet one is non-analytical, the other one is analytical. The difference apparently cannot be correlated with any other properties of the grammar.[10] Furthermore, there is some independent evidence in Finnish that case suffixes might have different allomorphs depending on whether a possessive suffix follows or not. The translative suffix is *-ksi* in word-final position but *-kse-* before a possessive marker, *e.g. huvi-ksi* ∼ *huvi-kse-ni* 'for (my) fun'.

Such a solution works fine for alternations like *huonee-seen* ∼ *huonee-see-si* 'into a/your room Ill. Sg.'. However, there are some problems with the genitive

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[9] Phonological structure deletion as such is not unproblematic. Recall the discussion from section 4.2.

[10] For discussion *cf.* Kaye (1992b, 1995).

plural. The genitive plural is exceptional in several respects. In general, the in-
flectional system in Finnish is quite well-behaved as regards allomorphy, *i.e.* the
only allomorphy we find is caused by vowel harmony (and, as we have seen, by
possessive markers). There are some exceptions (like the partitive ending *-A* $\sim$
-tA), but these are rather rare — until we get to the genitive plural. Usually the
case endings are the same for the singular and the plural (*kadu-lla* 'on the street
ADE. SG.' vs. *kadu-i-lla* 'on the streets ADE. PL.') but in the genitive plural we
find variation on a theme. The genitive singular ending is *-n*, the genitive plural
endings are *-in*, *-en*, *-den*, *-ten*, *-tten*. The selection of the appropriate suffix
often depends on the noun class, but there is also free variation. Consider the
following examples.

(111)

NOM. SG.	GEN. PL.
talo 'house'	*talo-j-en*
opettaja 'teacher'	*opettaja-i-n* $\sim$ *opettaj-i-en*
kuningas 'king'	*kuninka-i-den* $\sim$ *kuninka-i-tten*
vanhus 'old man/woman'	*vanhuks-i-en* $\sim$ *vanhus-ten*

Let us have a closer look at these variants in turn. The ending *-en* (preceded by
the plural marker *-i-*) seems to be the simplest case. We assume that it must have
an allomorph *-e-* to account for *talo-j-en* $\sim$ *talo-j-e-si* 'of (your) rooms GEN. PL.'
and the like. The next suffix, *-in*, is added to the bare vowel stem, *i.e.* there is no
plural marker. An example of this would be *kaikke-in* 'all GEN. PL.'[11] There are
two interesting observations to be made here. Firstly, there is no interaction with
the stem. Unlike the plural suffix *-i-*, which in many cases causes alternations of
the stem-final vowel (*cf.* section 5.3.1) and forms a diphthong with it, *-in* does
not trigger any alternations. Secondly, there is no CG. Both aspects allow two
interpretations. Either the suffix is too far away from the stem to interact or there
is a domain boundary (or both). We can propose a representation as in (112) for
the right edge of *kaikke-in*.

(112)   ... C_1 V_1 C_2 V_2 (]$)$ C_3 V_3 C_4 V_4

                k   e   i   n

It is not clear how to decide whether there is a boundary included or not.
However, CG could not apply in either case. The situation is much more com-
plicated with the suffixes *-den* $\sim$ *-ten* $\sim$ *-tten*: *-den* and *-tten* occur after the

---

[11] Historically, the *-i-* in *-in* is of course the plural marker.

regular plural marker *-i-*, *-ten* is attached to the so-called consonant stem (which does not exist for every noun). What is more, *-den* and *-tten* are *always* in free variation. Examples as in the following chart.

(113)

Nom. Sg.	Gen. Sg.	Gen. Pl.
rengas 'ring'	*renkaa-n*	*renka-i-den* ∼ *renka-i-tten*
avain 'key'	*avaime-n*	*avain-ten* (but also *avaim-i-en*)

It is clear from the lack of CG that *-tten must* be *-tte]n, i.e.* it contains an internal boundary. It might be unexpected to find such a boundary within a case suffix, but historically this marker is complex. The coronal stop we see is an old number marker.[12] Even though this complexity is no longer transparent, we can still observe in the behaviour of CG that *renka-i-tten* must in fact be [[*renka-i-tte]n*]. In contrast, *-den* must *not* contain any internal boundaries, otherwise we could not get *-d-* (which, as we assume, is always — except for loans — the weak version of *-t-*). As for *-ten*, two possibilities exist. Either there is an internal boundary, in which case the suffix is *-te]n* (similar to *-tte]n*), or there is none, in which case the *-t-* is actually a geminate which has undergone CG. It is not clear how to take a decision on which one it is.[13] What is clear, however, is that the shape of the suffix is in no way contradictory to our analysis of CG.

Returning to our previous discussion, we will have to say that each of the genitive plural markers has a particular allomorph used before possessive suffixes, *i.e. -i-, -e-, -de-, -te-, -tte-*. However, this leaves us with one problem. If none of these suffixes ends in a consonant and if there is a morphological boundary right after them, then how could we get *-de-, i.e.* a weak grade of *-te-*? In *tavaro-i-den* ∼ *tavaro-i-de-si* 'of your things' we will have to assume that the *-d-* is lexicalised as such and therefore independent of the workings of CG.[14]

7.4 The present passive

A similar problem is to be encountered in the so-called "passive" (which should rather be termed impersonal). Again, the irregularity is restricted to a very small area. The crucial forms are given in the following chart.

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[12] This can also be seen in the nominative plural ending *-t*: *katu* ∼ *kadu-t* 'street(s) Nom. Sg./Pl.'. For further details *cf.* Hakulinen (1957: 59)

[13] There are some possible clues which involve cases of the so-called "special" CG. Reasons of space preclude a further discussion of these.

[14] Note that we should still keep this distinct from the foreign *d*, which never alternates.

(114)

	sano-a 'to say'	*saa-da* 'to receive'	*tul-la* 'to come'	*halut-a* 'to want'
PRES.	*sano-ta-an*	*saa-da-an*	*tul-la-an*	*halut-a-an*
PAST	*sano-tt-i-in*	*saa-t-i-in*	*tul-t-i-in*	*halut-t-i-in*
PAST PT.	*sano-ttu*	*saa-tu*	*tul-tu*	*halut-tu*
PRES. PT.	*sano-tta-va*	*saa-ta-va*	*tul-ta-va*	*halut-ta-va*

Modern Finnish has two passive markers, *-tA-* and *-ttA-*.[15] The latter is used after stems ending in a short vowel, the former elsewhere. This accounts for the distinction to be observed in (114); *sano-a* on the one hand, *saa-da*, *tul-la* and *halut-a* on the other. Here we will concentrate on two classes of verbs, the types *sano-a* 'to receive' and *saa-da* 'to reveive', which illustrate the problematic issues well.[16] Let us begin with *sano-a*. In the past passive (*sano-tt-i-in*), the past passive participle (*sano-ttu*) and the present passive participle (*sano-tta-va*) we find a strong grade *-tt-*. In the present passive, however, we are faced with a weak grade *-t-*, *sano-ta-an*, even though there is no trigger to be seen. We might therefore suspect that these two forms are not related via CG at all, but rather that there is a specific marker for the present passive. In other words, the *-t-* in *sano-ta-an* is what it seems to be: a singleton stop, not an underlying geminate. This solution runs into two problems, the first of which becomes evident in a word like *luke-a* to read. In the active we find *lue-n* 'I read', *lue-t* 'you read', *luke-e* 's/he reads' etc., which is just what we should expect. CG is triggered by the affixation of *-n* and *-t*, but not by the lengthening of the stem-final vowel (in the third person singular). The present passive, however, also displays the weak grade of the stem: *lue-ta-an*. In other words, it seems as if there *is* an underlying geminate which is responsible for CG in the stem but also undergoes CG itself. Compare this to the past passive *lue-tt-i-in*. Here it is quite obvious what is going on: The geminate *-tt-* triggers CG in the stem but it is not affected itself, since it is followed by a long vowel. This is in contrast to the present passive, where the (presumed) geminate shortens for a reason we do not know.[17] The second problem we have to face when claiming that the present passive markers are all
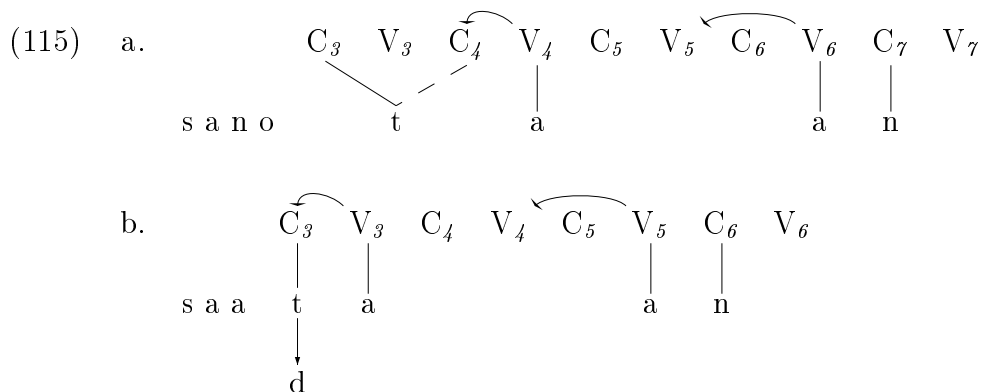
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[15] For details on their history and interrelation *cf.* Fromm (1982: 106ff), Fromm & Sadeniemi (1956: 92ff), Hakulinen (1957: 41, 173ff).

[16] The infinitive *saa-da* is — appearances to the contrary — not exceptional. We will discuss this form in section 8.2.2.

[17] The diachronic reasons for this exceptionality are clear. The present passive *sano-ta-an* comes from **sano-t̆ta-k-sen*, where *t̆t* represents a geminate shortened by CG. In other words, there used to be a present marker *-k-*, followed by the "personal" ending *-sen*. This was — and still is — an environment for CG, and *-tt-* shortened accordingly. The present marker is lost in modern Finnish, the weak grade of the passive suffix, however, has survived. For details *cf.* Fromm & Sadeniemi (1956: 92ff), Hakulinen (1957: 173ff).

lexicalised as such is the form *saa-da-an* 'it is (being) received'. We claimed in section 3.1.1 that all instances of native *d* are derivable via CG, *i.e.* the *-d-* in *saa-da-an* ought to be the weak grade of a *-t-*.

Austerlitz (1983) put forth a solution to this problem which might to some extent also be useful for us. He assumes that there is a particular marker for the present passive which he terms "XX"; it is a "gradation-inducing consonant cluster with no other properties" (Austerlitz 1983: 84). Working in a non-autosegmental framework he cannot relate this "XX" to anything else, which makes his proposal look like an *ad hoc* solution. "XX" is highly abstract consonantal material which triggers CG and is then deleted itself later on in the derivation, leaving no trace of its existence except for having caused the weak grade in the stem. The assumption of a CV skeleton, however, allows us to specify precisely what this mysterious object is. We can propose that it is an empty CV pair which marks the present passive.[18] The problematic forms are thus to be represented as follows. (For reasons of space we will concentrate on the right edge.)

(115) a. C_3 V_3 C_4 V_4 C_5 V_5 C_6 V_6 C_7 V_7

    s a n o   t   a   a   n

    b. C_3 V_3 C_4 V_4 C_5 V_5 C_6 V_6

    s a a   t   a   a   n

    d

In both cases there is nothing which could prevent the vowel of the passive marker (V_4 in (115a), V_3 in (115b)) from governing the preceding onset; the next filled nucleus is simply too far away. The passive marker gradates accordingly and we end up with the right form.

One could argue that this is a highly questionable solution which accounts for the data in an *ad hoc* fashion. In fact, there are a number of questions which remain unanswered. One concerns the so-called "personal" ending *-Vn* we encountered after the passive marker in *sano-ta-an* and *sano-tt-i-in*. The vocalic portion of it is usually seen as a copy of the preceding vowel (Fromm 1982: 106).

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[18] This marker is unique to the present passive, it does not occur in the active forms. It is also absent from the past passive, where we find the regular tense marker *-i-* instead. *Cf.* Bendjaballah (1999, in press) for a similar analysis of the negative preterite in Kabyle Berber or Rennison (2001) on German *-e* ([ə]) plurals as an empty CV pair.

If such were the case, however, this would mean that spreading can take place over a very large site (from V_4 to V_6 in *sano-ta-an* and from V_3 to V_5 in *saa-da-an*, respectively). Also, it is not clear why it would leave the intervening empty nucleus unaffected. Furthermore, one might object, this is a very abstract approach. In fact, abstractness itself is not that much of a problem. It seems to be clear that both native speakers and linguists have to abstract away from the speech signal to a greater or lesser extent. It is not self-evident whether demanding representations which are closer to the surface but incapable of expressing regularities is *per se* better than allowing for more abstract representations. Positing empty positions as such amounts to a higher degree of abstractness; yet it seems to be the only feasible way to state certain generalisation which could not be captured otherwise. The approach taken here shifts its focus from burdening morphology with seemingly irregular patterns to making use of what may be abstract, but nevertheless well motivated, exceptionless phonological principles (government, licensing, skeleton etc.). The peculiarities of the Finnish passive forms have to be implemented in some way. So far, it seems promising to apply the (already established) phonological mechanisms of CG to the problematic areas as well.
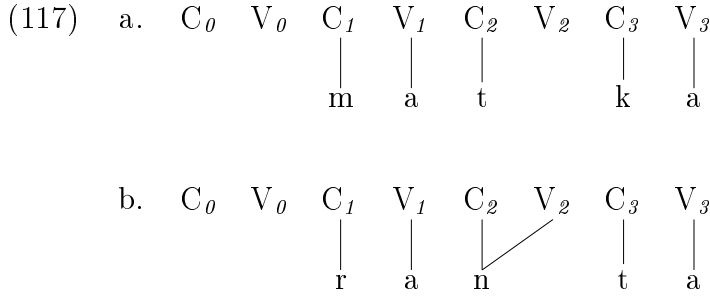
Chapter 8

Further details

8.1 Resistant clusters

There are some clusters in Finnish which are notoriously resistant to CG. Interestingly enough, all of them are obstruent-obstruent clusters. They provide a valuable control for our present analysis. The table in (116) provides some examples.
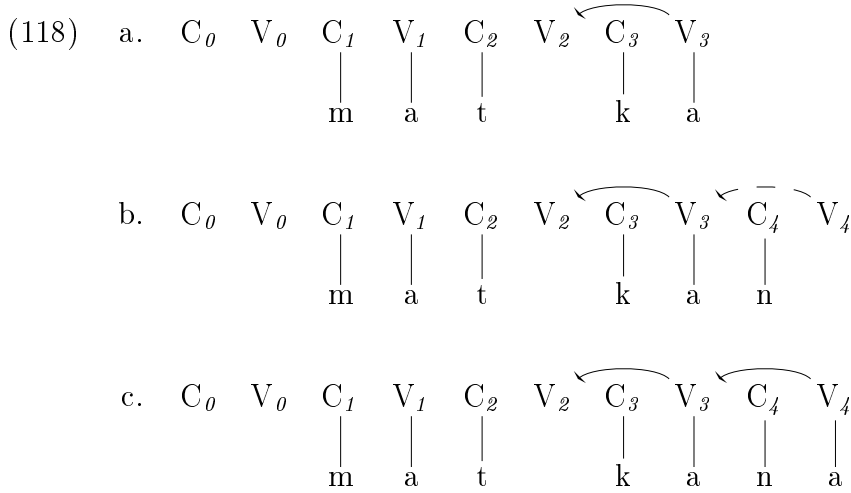
(116)   *-tk-*   *matka ∼ matka-n*   'journey Nom./Gen. Sg',
                        pitkä ∼ pitkä-n   'long Nom./Gen. Sg'
        -sp-   *piispa ∼ piispa-n*   'bishop Nom./Gen. Sg',
                        vispilä ∼ vispilä-n   'whisk Nom./Gen. Sg'
        -st-   *aisti ∼ aisti-n*   'sense Nom./Gen. Sg',
                        estä-ä ∼ estä-n   'to prevent ∼ I prevent'
        -sk-   *hauska ∼ hauska-n*   'fun Nom./Gen. Sg',
                        yski-ä ∼ yski-n   'to cough ∼ I cough'
        -hk-   *sähkö ∼ sähkön*   'electricity Nom./Gen. Sg',
                        suihku ∼ suihku-n   'shower Nom./Gen. Sg'

In all these examples the consonant we would expect to undergo CG is preceded by an obstruent.[1] Applying our analysis to these cases, we can in fact give a principled explanation for the absence of CG. Consider the representation of a word such as *matka* 'journey', compared to *ranta* 'beach'.

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[1] Note in addition that we do find CG in some words containing *-hk-*, often optionally: *uhka ∼ uha-n* 'threat Nom./Gen. Sg', *vihko ∼ vihko-n/viho-n* 'notebook Nom./Gen. Sg', *nahka ∼ nahka-n/naha-n* 'leather, skin Nom./Gen. Sg'. Words with *-ht-* always undergo CG, thus *lahti ∼ lahde-n* 'bay'. All these cases are of later origin (Fromm 1982: 51).

(117)   a. C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3
                       | | | | |
                     m   a   t   k   a

b. C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3
(with n in C_2 linked to both C_2 and V_2)
          r   a   n   t   a

In (117b), V_2 is filled due to the fact that the nasal n is linked to both the onset (C_2) and the nucleus (V_2). In addition C_3 governs C_2, thus no relationship of government is needed between V_3 and V_2 in order to render the form grammatical. This was discussed at length in 5.3.2. The situation is different in (117a). Here, the t in C_2 cannot simultaneously occupy V_2, since it is an obstruent. Apparently, it cannot be governed itself, either. We have to assume that V_3 acts as the governor of V_2. Since V_2 in *matka* will always be in need of government, V_3 will never be in a position to hit its own onset and therefore C_3 is always safe from CG. This is depicted in (118).

(118)   a. C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3
                     m   a   t   k   a

b. C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3 C_4 V_4
                     m   a   t   k   a   n

c. C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3 C_4 V_4
   m   a   t   k   a   n   a

Such an approach can be compared to Charette's (1990, 1991) analysis of French schwa, where it is argued that [ə] in French is the realisation of an ungoverned empty nucleus. However, a governed empty slot can also repel government if it has a task to fulfil. Such is the case in the realisation of the word *parvenir* 'to reach' as [parvənir], not *[parvnir] (Charette 1990: 240). The i could in principle govern the preceding empty nucleus, yet this is not case, since the empty position has to license its onset v to govern the preceding r. This is parallel to the Finnish data. The second a in *matka* will always be unaffected by external influence, since it has a job to do.

The analysis for the clusters *-sp-*, *-st-* and *-sk-* runs exactly parallel to *matka*. Being an obstruent, *s* is not allowed into a vocalic position. It also fails to qualify as a governee. The empty nucleus enclosed within the cluster remains unfilled and has to be governed by the subsequent nucleus. Therefore, the second member of the cluster is safe from lenition. (119) gives the representation of *estän* 'I prevent'.

(119)　C_0　V_0　C_1　V_1　C_2　V_2　C_3　V_3　C_4　V_4

　　　　　　　　　　 | 　　 | 　　　　　 | 　　 | 　　 |
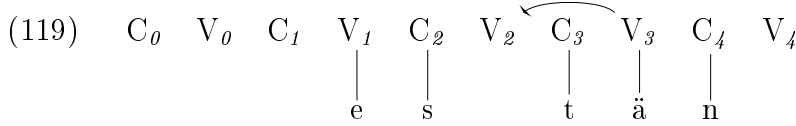
　　　　　　　　　　 e 　　 s 　　　　 t 　　 ä 　　 n

Phonotactic facts corroborate our analysis. While we do find clusters of the structure sonorant + geminate obstruent (*cf.* section 3.1.3), there is no such thing as **-spp-*, **-stt-* or **-skk-*. The reason for that is clear — consider the following display, where α stands for an arbitrary plosive and β for an arbitrary vowel.

(120)　*　...　C_1　V_1　C_2　V_2　C_3　V_3　...

　　　　　　　　　 | 　　　　 \　 /　　 |

　　　　　　　　　 s 　　　　 α 　　 β
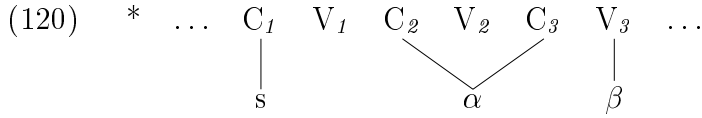
Here we have a sequence of two empty nuclei. This is a very similar situation to what we had in the case of *helppo*. Compare the representation of the illicit cluster **-spp-* in (120) to the structure of *helppo* in (80), repeated here as (121) for convenience.

(121)　C_0　V_0　C_1　V_1　C_2　V_2　C_3　V_3　C_4　V_4

　　　　　　　　　　 | 　　 | 　　 |　 /　　 \　 /　　 |

　　　　　　　　　　 h 　　 e 　　 l 　　　 p 　　　 o
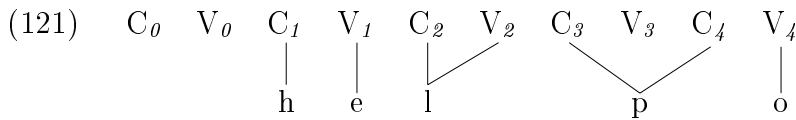
The clusters only differ in their first segment, but this difference is crucial. As a sonorant segment, the *l* in *helppo* is allowed into V_2, thus rendering the structure grammatical. Since *s* is *not* a sonorant, it cannot be associated with vocalic positions; V_1 in (120) therefore remains unidentified and the whole cluster is ungrammatical.

This also explains why we do not find clusters with three members where the first segment is an obstruent. Such a cluster would simply be ungrammatical; containing an unidentified empty nucleus it would violate the ECP. The remaining clusters of Finnish bear witness to our analysis, *cf.* section 3.1.3.

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8.2 Inverted CG

It has been claimed that there is a process of so called "inverted" CG as well (*e.g.* Karlsson 1983: 331ff). It owes its name to the fact that in the morphologically basic forms (like nominative or infinitive) we find the weak grade, whereas in the more complex forms (like the genitive) we are presented with the strong grade. In addition, the weak grade often seems to occur without any phonological reason. Such a conception is a natural consequence of a traditional approach to phonological representations, which forces one to see CG as morphologised and as being tightly connected with particular affixes. However, this leaves many questions unanswered, *e.g.* why the nominative (a "basic form") patterns together with the partitive, but not with the genitive. Also, it misses important generalisations, like the fact that words with inverted CG also have particular phonological properties in their stems which set them apart from the cases with "normal" CG. As we will see, there is a plain and uniform phonological explanation to both types.

The seeming irregularity of inverted CG is to be found both in nouns and in verbs. However, within these two domains, the phenomenon is restricted to certain classes. As regards the nouns, we find alternations such as *varas* ~ *varkaa-n* 'thief Nom. Sg./Gen. Sg.' or *sade* ~ *satee-n* 'rain Nom. Sg./Gen. Sg.'. In verbs, the phenomenon is displayed in the paradigm of a verb such as *tavat-a* ~ *tapaa-n* 'to meet ~ I meet'. Note that in both cases it is only the weak grade that is irregular, *i.e.* we find it in positions where we would not expect it to gradate. The strong grade *never* occurs in illicit configurations, *e.g.* before a geminate. Thus, the question posing itself again runs: why is lenition not prevented in configurations where it should be? In order to answer this, we will turn our attention to nouns and verbs separately.
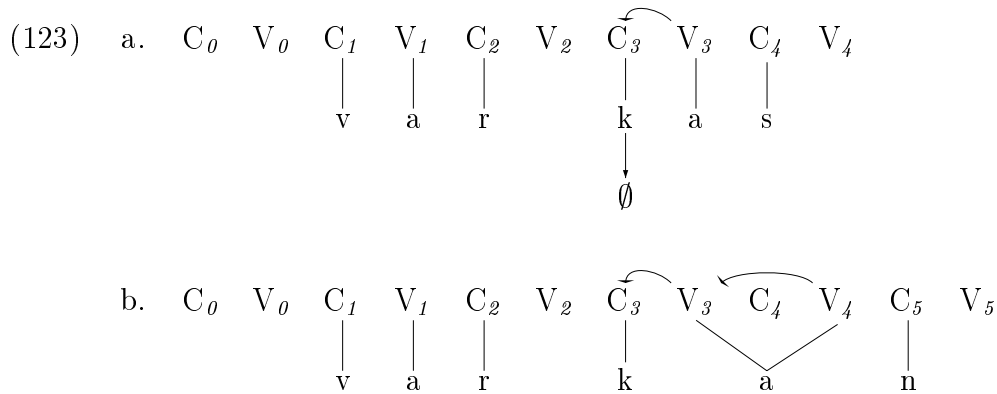
8.2.1 Nouns

The chart in (122) gives typical examples of nouns displaying inverted CG.

(122)

Nom. Sg.	Gen. Sg.	Par. Sg.
varas 'thief'	*varkaa-n*	*varas-ta*
asiakas 'client'	*asiakkaa-n*	*asiakas-ta*
ruis 'rye'	*rukii-n*	*ruis-ta*
ien 'gums'	*ikene-n*	*ien-tä*
toivoton 'hopeless'	*toivottoma-n*	*toivoton-ta*
lämmin 'warm'	*lämpimä-n*	*lämmin-tä*

In all these cases the nominative and the partitive display the weak grade, whereas the genitive shows the strong grade. This is not surprising, considering

what the structure of these forms must be. Let us take *varas* ~ *varkaan* 'thief
Nom./Gen. Sg.'.

(123) a. C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3 C_4 V_4

          v   a   r   k   a   s

                                     ∅

b. C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3 C_4 V_4 C_5 V_5

          v   a   r   k   a   n

This class of nouns is special in that different stems are used. In the genitive
we find the so-called vowel stem (*varkaa-*), whereas the partitive is formed from
the consonant stem (*varas-*), which is homophonous to the nominative. This is a
morphological particularity of this class, yet the workings of CG are completely
unaffected by it. CG applies as in all the forms we have seen so far. In (123a) V_3
cannot govern V_2 and hits its own onset instead. In (123b) V_4 governs V_3 with
the result that V_3 cannot govern itself and C_3 is safe.

Let us now turn to nouns which seem to end in a vowel.

(124)

| Nom. Sg.	Gen. Sg.	Par. Sg.
perhe 'family'	*perheen*	*perhettä*
herne 'pea'	*herneen*	*hernettä*
ori 'stallion'	*oriin*	*oritta*
sade 'rain'	*sateen*	*sadetta*
ote 'extract, bank statement'	*otteen*	*otetta*
syke 'pulse, beat'	*sykkeen*	*sykettä*

While the genitive and partitive forms are perfectly fine as regards CG, the
nominative forms might strike us as exceptional. Here we encounter the weak
grade, even though it is not clear why this should be. (125) gives (as we might be
led to believe) the representation of *sade* 'rain Nom. Sg.' (from *sata-a* 'to rain').

(125) C_0 V_0 C_1 V_1 C_2 V_2
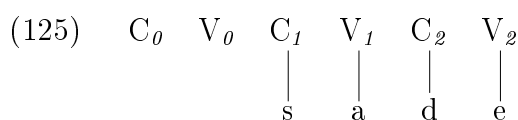
   s   a   d   e

As we have seen with words such as *katu* 'street' in section 5.3.1, there should be no weak grade before a word-final vowel. Since *sade* derives from *sataa* 'to rain' we can safely assume that the *d* is a weak grade of *t* and nothing else. Interestingly enough, all the words in (124) trigger the process of initial gemination we mentioned in section 3.1.1. That is, all these words cause the first consonant of the following word to geminate, *e.g. sadekausi* 'monsoon' [ˈsɑdekːɑusi] or *sadeku-uro* '(rain) shower' [ˈsɑdekːuːro] etc. We are therefore justified in assuming that the correct representation of *sade* is as in (126).

(126) C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3

             s   a   t   e

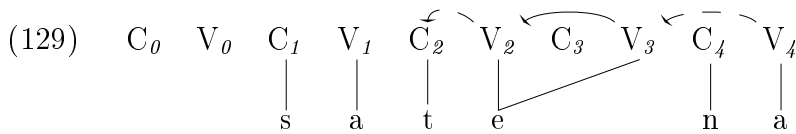   d
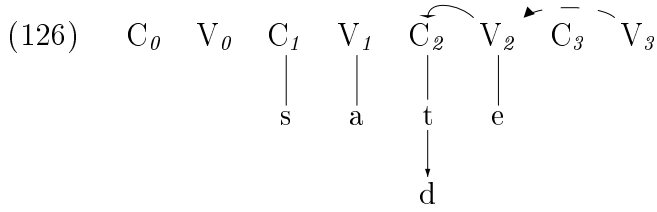
This serves two purposes. Firstly, the empty CV pair at the end of the word triggers CG and secondly, it provides the necessary space for the following consonant to geminate into. The same analysis is also proposed in Gibb (1992: 124ff). From our discussion of the alternation *varas* ∼ *varkaan* in (123) we know that in this particular inflectional class there are two stems. The genitive is formed from the vowel stem *satee-*, thus *satee-n*.

(127) C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3 C_4 V_4

             s   a   t   e   n
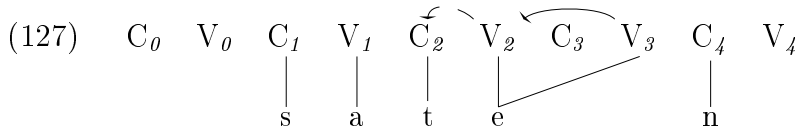
CG falls out quite naturally. The partitive, on the other hand, is formed from the consonantal stem and is homophonous with the nominative. This causes CG and lengthening of the partitive marker.

(128) C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3 C_4 V_4

             s   a   d   e   t   a
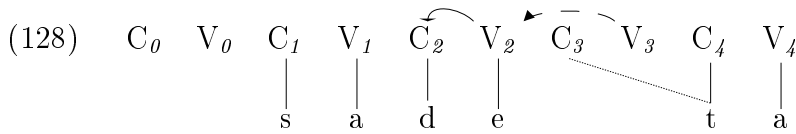
Last but not least let us consider the essive form *satee-na*.

(129) C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3 C_4 V_4

             s   a   t   e   n   a

101

Here we have to assume that government between V_4 and V_3 does not affect V_3, as in the case of the resistant clusters. If it did, V_3 could not itself govern and V_2 would be free to hit its onset. We have seen in the preceding chapters that nuclei contained within a governing domain (between a governor and a governee) are inaccessable. We can assume that the same holds true for a nucleus which is the head of a long vowel.

8.2.2 Verbs

Some classes of verbs exhibit the same pattern as nouns of the *sade*-type. Among these is the most productive class of present-day Finnish (type *tavata* 'to meet'). This shows that we are not dealing with some historical left-over — in fact, inverted CG takes place in newly coined verbs and loans as well, *e.g. startata* ∼ *starttaan* 'to start ∼ I start', *skeitata* ∼ *skeittaan* 'to skate ∼ I skate', *buukata* ∼ *buukkaan* 'to book ∼ I book' etc. The chart in (130) gives some more examples.

(130)

| INF. I	1st SG. PRES. IND. ACT.	3rd SG. PRES. IND. ACT.
tavata 'to meet'	*tapaan*	*tapaa*
tykätä 'to like, to love'	*tykään*	*tykää*
pelätä 'to fear'	*pelään*	*pelää*
luvata 'to promise'	*lupaan*	*lupaa*
siepata 'to catch, to kidnap'	*sieppaan*	*sieppaa*
poiketa 'to diverge'	*poikkean*	*poikkeaa*
rohjeta 'to dare'	*rohkenen*	*rohkenee*

Judging from the surface form of these words, we could again assume the following representation for the infinitive *luvata*.

(131)   * C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3

   l   u   v   a   t   a

In fact, the representation in (131) cannot be correct. With infinitives we encounter the same phenomenon of initial gemination as in the nouns discussed before. A sentence such as *en halua luvata mitään* 'I don't want to promise anything' is realised as *en halua luvata*[m:]*itään*. In other words, the infinitive suffix ends in an empty CV pair, which can also be seen in infinitives whose stem

ends in a long vowel or diphthong — *saa-da* 'to get' or *juo-da* 'to drink'.[2] Thus, the *d* in *saada* is no different from the one in *sade* as regards its origin; both come from *t*.

Now, if the infinitive ends in an empty CV pair and not just in a vowel, then the *t* in *luvata* cannot be a single, plain *t*, either. It must itself be the result of CG affecting a geminate. The correct representation is thus as follows.

(132) C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3 C_4 V_4 V_5 V_5

                        l   u   p   a   t   a

                        v
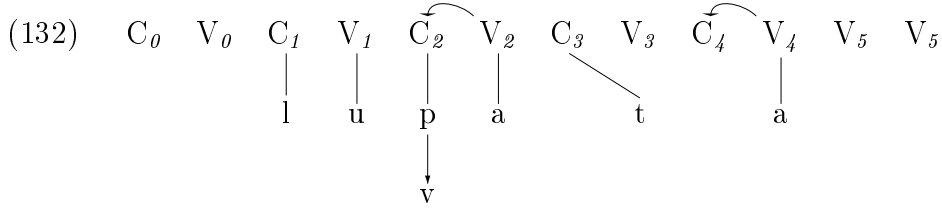
This amounts to proposing that *luvata* is made up of a stem *luvat-* and an infinitive suffix *ta* (with an empty CV pair following). Again, a different stem is used for the finite forms, thus *luvata* ~ *lupaan* 'to promise ~ I promise' or *pelätä* ~ *pelkään* 'to fear ~ I fear'. The representation of *lupaan* is given in (133), which can be contrasted with (132).

(133) C_0 V_0 C_1 V_1 C_2 V_2 C_3 V_3 C_4 V_4

                        l   u   p   a   n
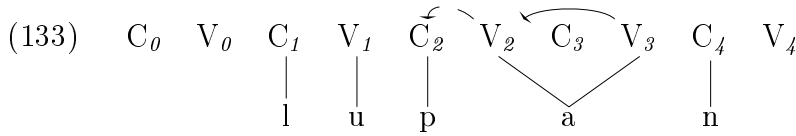
Summing up the discussion of nouns and verbs, we can now record that in our analysis it is not necessary to make use of rather questionable solutions such as "inverted CG". The distribution of grades follows quite automatically from the representation. Even cases that seem to contradict the "general rules" of CG, such as the alternations in *sade* ~ *sateen* 'rain Nom./Gen Sg.' or *luvata* ~ *lupaan* 'to promise ~ I promise', can be explained quite smoothly.

8.3   Diphthongs

Another issue to be considered is that of diphthongs. Here, we find an interesting asymmetry: on the one hand there are diphthongs that behave as if they were long vowels (thus blocking the effects of CG on the preceding onset), on the other hand there are those that behave as if they were short vowels and allow CG to

---

[2] The long sonorants in *tulla* 'to come', *mennä* 'to go' etc. are also due to CG.

apply. Let us consider both groups on the basis of nouns, where the diphthongs to be found in the plural forms will be an illustrative example. A word such as *matto* 'carpet' displays the strong grade in the nominative, but the weak grade in its adessive form: *matolla* 'on a carpet'. The same holds true for the plural which is indicated by the marker -*i*-, giving us *matoilla* 'on carpets'. In other words, the diphthong created by affixation of the plural ending does not cause blockage of CG. This might come as a surprise, considering our results when we were discussing illative forms in section 5.3.1. There we saw that affixation of the illative suffix -*Vn* does prevent CG from applying; for *matto*, accordingly, the illative form would be *mattoon*, without gradation. So what is the difference between the suffix -*Vn* and a sequence of suffixes as in -*i*- + -*llA*?

In order to answer this question, a further piece of evidence has to be adduced. Another word, *rengas* 'ring', behaves quite differently. Its adessive plural is *renkailla*, displaying the strong grade, which is in sharp contrast to *matoilla* with its weak grade. Thus, the next question will have to be: Why is the diphthong in *matoilla* "permeable" to CG, while the one in *renkailla* is not?

We can shed some light on both questions by comparing some more forms of the two nouns under discussion. Consider the following diagram.

(134) | Nom. Sg. | *matto* 'carpet' | *rengas* 'ring' |
Gen. Sg.	*mato-n*	*renkaa-n*
Ill. Sg.	*matto-on*	*renkaa-seen*
Ade. Sg.	*mato-lla*	*renkaa-lla*
Ade. Pl.	*mato-i-lla*	*renka-i-lla*

It is clear from (134) that the form of the stem (to be seen in the genitive) is crucial. Let us assume that the plural marker -*i*- does not have any structure by itself; it floats and simply attaches to the stem. There are two possibilities here: Either a *short* contour segment (*cf.* Rennison 1998) emerges (as in *mato-i-lla*) or the preceding vowel is deleted, which can be seen in words such as *järve-ssä* 'in the lake' ~ *järv-i-ssä* 'in the lakes' or *kuva-ssa* 'in the picture' ~ *kuv-i-ssa* 'in the pictures', where the final vowel is deleted.[3] In any event, the result is a short segment and CG applies as usual. If, on the other hand, the stem ends in a long vowel (as in the case of *rengas* 'ring' with its stem *renkaa-*), then the suffix only attaches itself to the second nucleus. By the principle of precedence of new (additional) material, the melody is no longer realised in the nucleus (*cf.* Rennison 1990). This is shown in (135):

---

[3] The exact nature of the loss or mutation of the stem-final short vowels is of no further importance for the argument and will therefore not be discussed here.

(135)

$$C_0 \quad V_0 \quad C_1 \quad V_1 \quad C_2 \quad V_2 \quad C_3 \quad V_3 \quad C_4 \quad V_4$$

r e n k a i
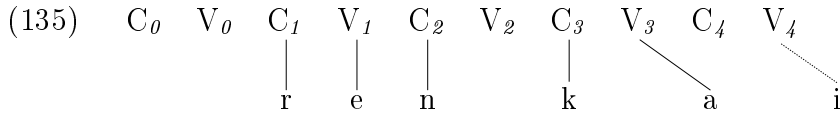
The absence of CG falls out quite naturally. Other diphthongs in non-initial syllables which are *not* due to the affixation of the plural marker *-i-* are usually phonologically long, *i.e.* they always occupy two nuclear positions. Compare a word such as *rakas* 'dear' (stem *rakkaa-*) or *rakastaa* 'to love' to the noun *rakkaus* 'love' (genitive *rakkauden*).

8.4 Imperatives and negative forms

Now that the cases of so-called inverted CG have successfully been accounted for in 8.2, another detail in the complex picture can be dealt with concisely. Consider the following imperative forms:
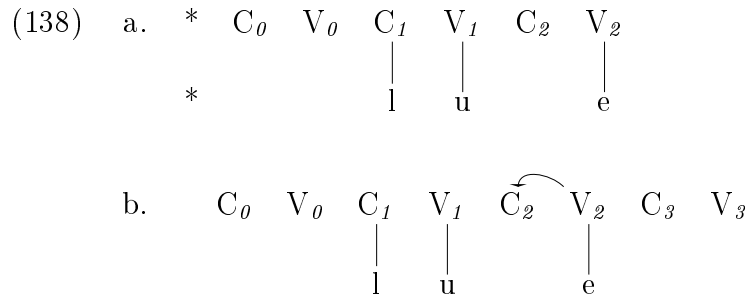
(136)

Inf. I	2nd Sg. Imp.	2nd Pl. Imp.
luke-a 'to read'	*lue*	*luke-kaa*
vaati-a 'to demand'	*vaadi*	*vaati-kaa*
otta-a 'to take'	*ota*	*otta-kaa*
anta-a 'to give'	*anna*	*anta-kaa*
kulke-a 'to go'	*kulje*	*kulke-kaa*

The same form as in the 2nd singular imperative also serves as the negative form of both the 2nd singular imperative and the present indicative.[4] Consider the following chart:

(137)

2nd Sg. Imp.	negated 2nd Sg. Imp.	negated 2nd Sg. Ind.
lue	*älä lue*	*et lue*
vaadi	*älä vaadi*	*et vaadi*
ota	*älä ota*	*et ota*
anna	*älä anna*	*et anna*
kulje	*älä kulje*	*et kulje*

---

[4] Negation in Finnish is achieved by means of a (defective) negation verb, which inflects for person and number, but not for voice, tense or mood — except for the imperative forms, where mood is also expressed in the negation verb. The main verb itself appears in a non-finite form. Thus *lue-n* 'I read Pres.' ∼ *e-n lue* 'I don't read', *lue-t* 'you read Pres.' ∼ *e-t lue* 'you don't read', as opposed to the imperative *älä lue* 'don't read 2nd Sg.'.

In all the forms in (137) we seem to get CG without any apparent reason. This, however, is not true — again we are dealing with forms ending in an empty CV pair, which we have already seen several examples of, *e.g. sade ~ sateen* 'rain Nom./Gen. Sg.'. The correct representation of a form such as *lue* (be it imperative, negated imperative or negated present) is therefore not as in (138a) but as in (138b).

(138) a.   * C_0 V_0 C_1 V_1 C_2 V_2

          *   l   u   e

       b. C_0 V_0 C_1 V_1 $\overset{\frown}{C_2}$ V_2 C_3 V_3

                              l   u   e

Further evidence for the correctness of this analysis can be found in sentences such as *en lue tätä kirjaa* 'I don't read this book' or *älä lue tätä kirjaa* 'don't read this book', which are realised as *en lue*[t:]*ätä kirjaa* and *älä lue*[t:]*ätä kirjaa*, respectively.

Chapter 9

Summary

The present thesis investigates Finnish Consonant Gradation (CG) in the framework of Government Phonology (PG). CG is a lenition phenomenon causing paradigmatic alternations. Gibb (1992) already presented an analysis in terms of GP; however, the radical changes within the theory over the past years make a re-analysis desirable.

Chapter 2 is a short introduction to the basic principles of GP, a phonological theory oriented towards cognition. It is modelled after the Principles and Parameters approach (Chomsky 1981, 1995) of generative syntax. Language-specific rules are replaced by a set of universal parameters, whose interaction determines phonological phenomena. Chapter 3 gives a general overview of the phonological system of Finnish, concentrating on the workings of CG. The enormous problems traditional theories of phonology have to face become clear — the concept of the syllable is more of a burden than an efective tool. Accordingly, CG presents itself as a chaotic phenomenon which seems to depend on morphology to a very large extent. However, as Gibb (1992) was able to show, there is a very simple pattern which CG follows and GP offers the appropriate means to describe it. Gibb's analysis is discussed at length in chapter 4. The issue is raised whether Proper Government allows different parameter values for its directionality. Gibb argues that Proper Government proceeds from left to right in Finnish and that CG is a mere consequence of this. However, recent work in GP has shown that government should only be assumed to proceed from right to left. For this reason chapter 5 presents a thorough re-analysis of CG which makes use of exclusively right-headed governing relations. In fact, the theory of Coda Mirror (Ségéral & Scheer 1999) and its successor, Coda Mirror Plus (Szigetvári 1999), provide the necessary tools for describing the alternations. The same holds true for Kaye's (2000) model of the internal structure of segments, which allows for the alternations to be captured very easily; CG is simply the loss of the element ʔ. Nevertheless, we review a number of proposals claiming that the inventory of segments can be reduced even further. Chapter 7 deals with the interaction of phonology and morphology.

It becomes clear that there is only little interaction (*cf.* Gibb 1992). The final chapter is dedicated to remaining issues, which used to be quite problematic for traditional approaches. They turn out to fit into the analysis quite well.

Chapter 10

Deutsche Zusammenfassung

Die Problemstellung vorliegender Arbeit ist die Frage, inwieweit sich der finnische Stufenwechsel im Rahmen der **Rektionsphonologie** (engl. *Government Phonology*) erklären läßt. Der Stufenwechsel ist ein Lenitionsphänomen, welches paradigmatische Alternationen verursacht. Mit Gibb (1992) liegt bereits eine rektionsphonologische Analyse vor, allerdings machen die theorieinternen Veränderungen der letzten Jahre eine Reanalyse erforderlich.

Im Kapitel 2 wird eine kurze Einführung in die Rektionsphonologie gegeben, welche sich als explizit kognitive Phonologietheorie versteht und sich in ihrer Grundkonzeption an die Principles-and-Parameters-Theorie (Chomsky 1981, 1995) der generativen Syntax anlehnt. Anstelle von sprachspezifischen Regeln treten universelle Prinzipien, aus deren Interaktion sich phonologische Phänomene herleiten lassen sollen. Das Kapitel 3 verschafft uns einen generellen Überblick über die phonologische Struktur des Finnischen und insbesondere über den Stufenwechsel. Hierbei zeigt sich bereits, welchen Problemen sich eine linguistische Theorie stellen muß, die mit Konzepten wie der "Silbe" arbeitet und sich im allgemeinen sehr stark an Oberflächenformen orientiert. Bei einer derartigen Herangehensweise präsentiert sich der Stufenwechsel als scheinbar chaotisches Sammelsurium von Alternationen und deren Bedingungen, was schlichtweg dazu auffordert, auf morphologische Eigenschaften zurückzugreifen. Wie allerdings bereits Gibb (1992) zeigen konnte, verbirgt sich unter der Oberfläche ein sehr einfaches Muster, das mit den Mitteln der Rektionsphonologie problemlos beschrieben werden kann. Ihre Analyse wird in Kapitel 4 diskutiert, unter anderem in Bezug auf die Frage, wieweit der Mechanismus der sogenannten Echten Rektion (engl. *Proper Government*) einem Parameter unterliegen sollte, der seine Direktionalität regelt. Gibb geht davon aus, daß Echte Rektion im Finnischen von links nach rechts auftritt und daß der Stufenwechsel nur eine Konsequenz davon ist. Neuere Arbeiten innerhalb der Theorie argumentieren jedoch dafür, daß Rektion zwischen Segmenten nur von rechts nach links erfolgen sollte. Aus diesem Grund wird in Kapitel 5 eine Reanalyse des Stufenwechsels versucht, welche sich

ausschließlich linksgerichteter Rektionsbeziehungen bedient. Es stellt sich heraus, daß sich im Rahmen der Coda-Mirror-Theorie (Ségéral & Scheer 1999) und dessen Nachfolger, Coda Mirror Plus (Szigetvári 1999), die finnischen Alternationen gut beschreiben lassen; der Stufenwechsel gliedert sich damit in eine Reihe anderer Lenitionsphänomene ein, die innerhalb dieser Theorien bereits zufriedenstellend erklärt werden konnten. Selbiges gilt für die Untersuchung der internen Struktur der alternierenden Segmente in Kapitel 6. Das Modell von Kaye (2000) erlaubt eine sehr einfache Darstellung der Altenationen; es handelt sich schlicht um den Verlust des Elements ?. Im selben Kapitel gehen wir auch der Frage nach, ob sich dieses Element aus strukturellen Eigenschaften herleiten läßt, d. h. ob sich die Alternation noch weiter vereinfachen und verallgemeinern läßt. Kapitel 7 widmet sich ausführlich der Interaktion des Stufenwechsels mit der Morphologie, wobei sich (vgl. Gibb 1992) zeigt, daß es nur in sehr geringem Maße Interaktion gibt. In einem abschließenden Kapitel über verbleibende Problembereiche kommen die diskutierten Mechanismen noch einmal zur Anwendung. Wie sich herausstellt, passen auch scheinbar unregelmäßige Formen gut ins Gesamtbild der Analyse.

Abbreviations

ACT.	active	IMP.	imperative
ADE.	adessive	NOM.	nominative
ALL.	allative	PAR.	partitive
ESS.	essive	PL.	plural
GEN.	genitive	PRES.	present
ILL.	illative	PT.	participle
IND.	indicative	SG.	singular
INF.	infinitiv		

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