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ABSTRACT

A report of research on phonology consists of two parts. The first examines the direction in which syllables are "built"--whether the segment or the syllable came first. The first part looks at the effects that different forms of syllabification have on syllable structure, and explores which syllable structure accounts for most syllable-related phonological processes. Attention is given to patterns of child language acquisition and its effects on syllable structure. It is concluded that the solution lies in an analysis in which direction of syllabification has no role at all. The second part analyzes syllable structure in Sranan, a Surinam creole, in the context of the child language data in part I. Focus is on onset and rhyme structure and on patterns of initial /s/ in clusters when compared with Sranan's superstrate language, English. A strong parallel between creolization and first language acquisition patterns is theorized. Contains 53 references. (MSE)

SYLLABLE STRUCTURE

A Comparison of Different Analyses

Part I: Child Cluster Reduction and Compensatory Lengthening

Part II: Syllable Structure in Sranan

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". . . if people went around noticing everything that was going on all the time, no-one would ever get anything done."

Terry Pratchett, *Men at Arms*

Contents

§1 Introduction

In this brief introduction, I wish to defend the study of phonology. Defend, not only against attacks of others, but also to soothe my own mind and its doubts and questions. In a true scholarly atmosphere, no defence of any study should be necessary, and to think of it was once a curse alike, but I find myself too much a child of my time and environment not to be sensitive to the contemporary socio-economic pressures that surround us all. They are the pressures of a society for which science is, more and more, expected to be of direct and obvious value, in particular for the simple reason that society funds science that is of no *direct* 'use' to others. Where 'curiosity', 'interest' or 'hunger for knowledge' used to be sufficient reasons to study into the unknown, into what lies behind our doings, they are now no longer accepted as worth spending money on. The notion that a truly civilized society or culture needs knowledge *as well as* cement-mixers and corn-growers has lately been caused severe checks by the enemy that is money. For that is what we are all about.

Yet, there is not only the question of economic value. There is also that of what one might be able to do for others and for the building of society, of what one's own contribution to culture, general welfare and happiness might be. This is the question I wish to address here. I am aware that in doing so I undermine somewhat the stand, which I try to keep as my own, that hunger for knowledge is sufficient reason to delve into a subject. Even so, where a defence is asked, this is the one I will provide.

"Language is the mirror of mind" were the words used by Noam Chomsky to express the sense that the way in which we, as humans, describe and deal with our environment in language, tells a lot about how we actually perceive that environment, about how we *work*. In this sense, language provides insight into the "ghost in the machine". However, the statement can also be taken as more neurologically inspired. The way in which language works, its structure and (ir)regularities, is possibly a reflection of the way in which our human brain works in general. To what extent this is true should be an empirical question in the first place, but the answer will have major philosophical impact.

This problem has often been addressed by starting from the philosophical perspective, but I feel that this is taking things the wrong way around. We are not equipped to account for ourselves solely through reasoning, for our reasoning is unavoidably marred with the irrationality for which we try to account. Therefore, we should start with data, with what we can physically perceive and deconstruct, label and categorize. We should go from the regular to the irregular.

In this place, I will not go into the question whether there is such a separate thing as a 'language faculty' or not. I do not know. It suffices to say that language is formed in the brain, and to know about the brain we need to know about language. The brain is where humans distinguish themselves from animals, and to know about humans, we must know about the brain. Ergo, to know about humans, we must know about language.

The term 'language' covers an extremely broad domain of largely interactive areas. One of the possible divisions of this domain is the division into semantics, syntax, phonetics and phonology. In this division, phonology deals with what happens in the human brain to the smallest parts of language, the meaningful sounds of language.

The many regularities in this subdomain are subject to description by phonologists. This is done in order to be able to predict the possibilities and to map how our brain works with respect to the production and perception of linguistic sound. It seems hardly necessary to stress that knowledge in this subfield can tell a lot about the other subfields and the field of language as a whole. Therefore, to go back to the earlier line of reasoning, in order to know about language, we must know about phonology. We may then conclude that, although it is just a cog in the machine, a greater understanding of phonology is a small step towards a greater understanding of the human being and what it is made of.

Apart from this reason to study language and phonology, there is also a more directly practical purpose. Knowledge of phonology is applied in the development of speech-production and -perception machines. In order to make machines that do not need an enormous lexicon where all the words of a particular language are stored, it is vital to recognize the regularities, such as there are in stress patterns, assimilation, aspiration, (de)voicing and other processes, and to know the origin of these regularities. When this knowledge is applied, it is only the exceptions to the regular processes that need be stored in the lexicon. These machines work, in one way or another, with human speech and it is best to make them operate as similar to human beings as possible. Such an application of phonological knowledge will be helpful in a number of areas, such as security, dictation, translation and teaching, and be an aid to people with impaired hearing, sight or speech, depending on whether the machine transforms text-to-speech or speech-to-text.

So, which cog in the machine will be studied here? The first part of this thesis deals with the direction in which syllables are 'built'. It deals with the question of what was first, the segment or the syllable? In order to find the answer, I will look at the effects that different directions of syllabification have on syllable structure. Then, I will try to find which syllable structure is able to provide explanations for most phonological processes that are related to syllables. If the structure is correct, the direction of syllabification is correct. In the end, we will see that the solution really lies in an analysis in which the direction of syllabification has no role to play at all, but before we reach that conclusion, there is much to theorize upon. Specific attention is paid to the acquisition of language by children and what it does to their syllable structure, or, rather, what *they* do to syllable structure.

It has been widely noted that the language of children acquiring their mother-tongue resembles so-called creole languages. A creole is a language generated out of more than one other language. The structures of such languages tend to be 'simpler' than average languages, as are the structures of Child Language.

The second part of this thesis, therefore, deals with syllable structure in Sranan, a Surinam creole. I will attempt to give a unified account of the syllable structure in this language and that found in the Child Language data discussed in Part I. If the relation between creoles and the language of children does indeed exist, this has implications for the way we think about language and how it works in our minds. This will all be discussed in Part II, which will largely be a report of a trial-and-error quest for the optimal account.

A briefer discussion of the subject of part I can be found in Gilbers & Den Ouden (1994). I thank Dicky for his helpful guidance and for allowing me to use parts of our cooperative work for this thesis. For other helpful comments, advice and discussions, I thank Prof. dr. H. Chr. Wekker, dr. John Harris, Prof. dr. H. Eersel, dr. T. de Graaf and dr. J. Hoeksema. For providing the real Sranan data used in part II of this thesis, I wish to thank ms. Rinia Emanuels, who was a great help. Finally, although I will not mention

them all, many others have to be thanked for not giving up on a friend who analyses tiny parts of your speech.

Most of the work has been written during choking Groningen heat-waves, in the summers of 1994 and 1995. The thinking and reading behind the thesis, however, were mostly done in the thick of London fog and during a grey Groningen winter. This is to say that I had a marvellous time. Now, the turn is yours.

Part I

§2.1 Terminology and the domain of research

In this section, I will give a brief explanation of terms needed for a useful discussion of the present subject. For further introductory enlightening, I refer to such works as Katamba (1989), Hyman (1975) and Lass (1984).

§2.1.1 The domain

The field of phonological theory is divided into different domains of research. These domains are based on phonological groupings that are set in a hierarchical order. The elements in the domains often interact and are influenced by one another, so that research, in the same manner, does not adhere strictly to the hierarchical separation. Yet, the distinction is very useful.[1]

At the top of the hierarchy, we find the *utterance*, which can be anything from the briefest of sounds to the longest of speeches. An utterance is divided into *phrases*, which, in their turn, are divided into *feet*. The foot is the basic and clearest rhythmical unit in language. It is formed by its 'building blocks', *syllables*, which are also rhythmical units and next on the hierarchy.[2] Compared to rhythm in music, we can say that feet are the beats, whereas syllables are the notes of language. Research aimed at these four domains deals with *macro-phonology*.

If we delve even deeper into phonological structure, we enter the area of *micro-phonology*. Syllables consist of *segments*, or *phonemes*, the sounds of language. In certain phonological processes, certain groups of segments behave similarly. The binding factor here is formed by the *features* of which segments consist. If a segment shares a feature with another segment, these segments will behave similarly in a process triggered by the

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[1]For a more elaborate discussion of 'distinct groupings', see a.o. McCarthy (1988), who appears to have a more restrictive view on the domains and their interactions. Note also that the division given here is the conventional division. It is by no means universally accepted and is, for example, different from the analysis eventually adopted in this thesis (Schane 1994, Prince & Smolensky 1993).

[2]This is the conventional view-point. See Harris (1994) and my discussion of this work in §3.4 for a different anlysis in which only part of the "syllable" acts as a building block for the foot.

presence or absence of that particular feature.

The domain of this thesis is the borderline between micro- and macro-phonology, the area between segments and syllables. It will mainly focus on the internal structure of syllables and on how they are constructed.

§2.1.2 Defining the syllable

Some phonologists make a distinction between the *phonetic* syllable and the *phonemic*, or phonological syllable. The former is claimed to be the actual rhythmical unit that we can hear, whereas the latter has a number of phonological functions.

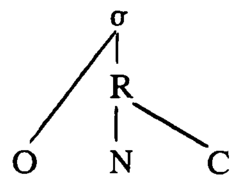
There are three possible phonological functions for the syllable: (I) It is the domain in which certain phonological processes take place; (II) *Phonotaxis*: Its structure indicates which combinations of segments are possible in a particular language; (III) *Prosody*: Its structure is a heavy factor in the assignment of phonological stress - the 'heavier' the syllable, the sooner it is assigned stress. Naturally, the three functions are not so rigidly separate from one another, but the division between them will help to make the treatment of syllables better-organized. To provide an answer to the questions asked in this thesis, of how and from what the syllable is built, examples and/or evidence will often come from phonological processes, as well as from phonotactic and prosodic arguments.

A syllable consists of phonemes, segments that may be divided into *consonants* (C's) and *vowels* (V's). The 'centre-position' of a syllable, without which there is none, is the *nucleus*, or *peak*.[3] The phonemes that belong to the same syllable as the nucleus and precede it are collectively called the *onset*, whereas the tautosyllabic phonemes that follow the nucleus make up the *coda*. In some theories, the nucleus and the coda are grouped into the *rhyme*. This is mainly because stress and tone assignment seem to neglect the segments that make up the onset and depend only on what comes after that. However, rhymes are controversial and their status is an issue still under serious dispute

[3]These terms are not synonymous. A nucleus may in some theories (e.g. Cairns & Feinstein 1982, Van der Hulst 1984) be subdivided into peak and satellite, or adjunct, where the peak is then the head of the nucleus.

(see a.o. Clements & Keyser 1983, Lass 1984 and Van der Hulst 1984). A basic picture of a syllable, including a rhyme, looks like this:

(1) *Example of syllable structure*



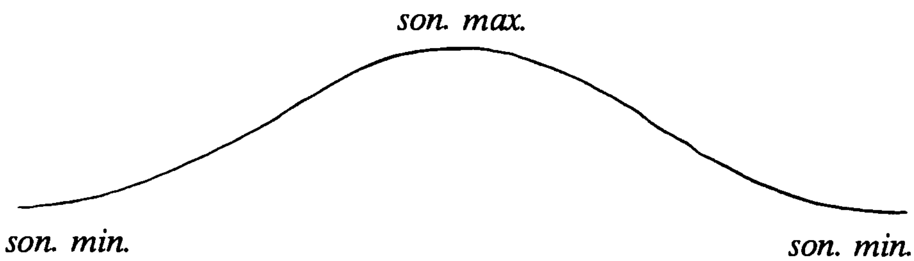
(σ = syllable node, O = onset node, R = rhyme node,
N = nucleus node, C = coda node)

Note that different theories, to which we will later return, make different claims about the number of positions possible in the onset, nucleus and coda. There is also much disagreement on further structure.

It has been accepted for a long time that syllables in all languages show the same *sonority curve* or *slope*, with the onset and coda being of a lower level of sonority than the nucleus of a syllable. Sonority is a phonological feature that has not been measured and it is therefore not a phonetic reality.[4] The feature is relative, or gradual, as opposed to absolute, and the slope has been incorporated in the syllable models of a.o. Kiparsky (1979) and Gilbers (1992).

[4]Gilbers, p.c. There is, however, much dispute over this claim.

(2) *The Sonority Slope*[5]



The gliding scale of sonority is reflected in the following hierarchy, which goes from the least to the most sonorous segment category:

(3) *The Sonority Scale*(adapted from Harris (1994:56))

plosives → fricatives → nasals → liquids → glides → high vowels → low vowels

It is often stated as fact that the most basic syllable is CV (cf. Malmberg 1963, Hyman 1975, Lass 1984), where C is the onset and V the nucleus. This is called the 'universal' or 'optimal syllable' and it is the syllable that children 'learn' first.[6] This claim, however, holds only in theories in which a long vowel occupies only one V position, and not two, since for example in Dutch we find no open syllables with a short vowel, i.e. light open syllables, so CV does not exist in that language.[7] Nevertheless, it is true that all languages in the world have syllables like CV, i.e. with onsets that are realized on surface-level, and some, e.g. Japanese, have only syllables of that form. Not

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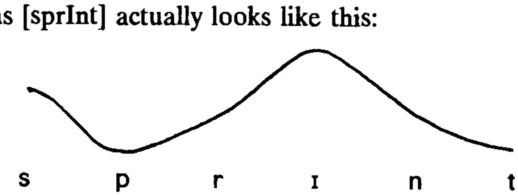
[5]The sonority slope of a word such as [sprInt] actually looks like this:



This has been used to argue for a non-conventional syllabification of such words, in which /s/ belongs to a different syllable (Harris 1994). I will return to this subject in greater detail below, but for now it suffices to note that there is disagreement even at the lowest level of syllable research.

[6]I will not embark on a discussion of the definition of 'learning' in First Language Acquisition here, because of the little relevance this would have to the topic I wish to discuss. What I mean here is that CV is the first syllable children are able to perceive and produce distinctively (cf. Ingram 1978, 1989).

[7]In Dutch, CV syllables only occur in interjections, such as *bah*, pronounced /bɑ/. This goes for most speakers of Dutch. There is, however, a minority of Dutch speakers that do pronounce light open syllables in words like *cabriolet*, but even then it can be argued that this is because the /b/ is ambisyllabic, so that the first syllable is actually /cɑb/, instead of /cɑ/.

all languages have syllables with phonetically realized codas and no languages have only those. Therefore, it can safely be claimed that syllables with realized onsets are less *marked* than those with realized codas.

Throughout this thesis, we will continuously have to deal with the question: "What is a syllable?" and we will find that the range of possible definitions seems to be quite infinite.

There are different perspectives from which to look at how a syllable is formed. What we are then looking for is a system that predicts the correct division of a string of segments into syllables. The word 'correct' saddles us with a problem here, for how do we know which is the true division into syllables? We have two options in deciding which phonemes belong to which syllable in a language, namely (1) to go by native speaker instinct or (2) to work from a specific hypothesis about syllable-structure, e.g. using a hypothesis claiming that syllable-initial voiceless stops are aspirated in English and then saying that 'after' is syllabified as /ɑ.ftər/, or /ɑft.ər/ (where '.' is a syllable boundary), because the /t/ is not aspirated. (1) has the disadvantage that if there is such a distinction between a phonetic syllable and a phonemic (or phonological) syllable, the average native speaker will probably only recognize the phonetic syllable, since the phonological syllable is quite an abstract concept. (2) is dangerous, because it can lead to a line of reasoning similar to "smoking opium puts you to sleep because of its dormitive power", i.e. entirely cyclic. Recognizing the dangers, however, we use both.

One assumption that plays a part in both options is what is formalized as a principle by Lowenstamm (1979, 1981): the *Maximal Cluster Approach* (MCA). It says that a permissible (= possible) word-initial cluster of consonants is also a permissible syllable-onset and that a permissible word-final cluster of consonants is also a permissible syllable-coda. The MCA is closely related to the claim that peak positions cannot be empty, i.e. that there is no syllable without a phonetically realized nucleus. An example of an analysis that works with the latter claim is Venneman (1988), who writes:

> ... the nucleus function NU, which characterizes one of the speech sound occurences in the basis of the syllable, as the designated element of the syllable, its nucleus, is never empty. (1988:5)

This approach works well in a number of cases, but it also raises some serious problems (cf. Noske 1982) and it is abandoned by phonologists working under the *Empty Nucleus*

Approach (ENA) (cf. Kaye, Lowenstamm & Vergnaud 1990, Harris 1994). I will discuss these in greater detail below in §3.4.

§2.1.3 Introducing directions

There are two main groups of analyses concerning the direction of the construction of syllables: *Bottom-Up* and *Top-Down*.[8] Bottom-Up type analyses (a.o. Kahn 1976, Hyman 1984, 1985, Hayes 1989) claim that there is first an unstructured string of segments, which group together into syllables, according to specific 'rules' or universal processes[9]. We say that the segments are *parsed* into syllable structure.

Top-Down analyses (a.o. Fudge 1969, Kiparsky 1979, Van der Hulst 1984, Gilbers 1992) posit that the syllable is first formed, with an internal structure, a *template*, and that the phonemes then drop into the correct positions. The positions are *filled*. Templates are *phonotactically constrained*, or *subcategorized*, which means that certain positions in the structured syllable can only contain certain types of phonemes, defined by their features. Top-Down and Bottom-up analyses will be compared to one another and their merits and flaws discussed (§3 & §4).

There are two types of theories that do not conform to this division into opposites. Noske (1992) proposes a syllabification theory that combines the two directional theories in the sense that unsyllabified segments trigger the imposition of a syllable template. The segments and the template are then linked to one another through *mapping*, a non-directional linking process. Noske's proposal is based on the principles of Autosegmental Phonology, which will be discussed in further detail below (§2.2 and §3.3). Syllabification

[8] I will not be concerned here with the question of whether syllabification occurs left-to-right or right-to-left, i.e. the 'horizontal direction'. There is a wide consensus that syllabification is mainly left-to-right, but there may be language-specific exceptions and there are certainly differing *re*syllabification processes.

[9] Throughout this thesis, I will remain hesitant about the use of *rule* as a linguistic term. I do not believe that it has a place in an advanced theory of language, since it is merely a descriptive term, without any psychological reality. We do not act according to rules; there is no rule that says a human heart must keep on beating and there is no rule that says we have to blink our eyes once in while - these processes are simply triggered by the physical structure and function of the organs concerned. In a representationalist view, which I take on this point, certain structural characteristics trigger processes. Stating a 'rule' may be useful for description, but we should be careful not to think of it as playing a part in the process it describes.

under the ENA (cf. §2.1.2) as proposed by Harris (1994) is conceived in terms of *licensing*, where the presence of segment A is a condition for the presence of segment B. This may be seen as a replacement for a conditionally imposed template such as Noske's, but Harris' analysis is interesting for other reasons.

Another theory that is not so easily categorized in terms of Bottom-Up or Top-Down is *Optimality Theory* (Prince & Smolensky 1993). In its analysis of syllabification, there is a place for both directions, and the 'tools' that are made use of, such as principles and constraints, stem from different types of analyses.[10] In OT, both Bottom-Up Parse and Top-Down Fill are available for the construction of syllables. OT will be discussed in §5. A major question concerning OT will be whether it is compatible with the theory of Universal Grammar. After the first wave of joy and merriment when the new theory was succesfully introduced, linguists are now more and more experiencing the downsides of the much celebrated programme. Luckily, discussion continues.

First, however, I will give a brief outline of the history of research in the domain under investigation (§ 2.2), and discuss the workings of some of the analyses of syllabification mentioned above individually (§3).

Although I have explained in this paragraph most of the basic terminology we will be using, the reader will find that other terms are explained along the way, as we encounter them.

[10]For reasons of clarity, I use the term 'syllabification' here, but in OT the process cannot really be called that. The theory is entirely output-oriented and what actually happens is that all the possible output syllable structures based on the input, which is a string of segments, are compared to one another, after which the one with the least amount of flaws wins. The optimal syllable structure becomes the real syllable structure.

§2.2 A brief history of syllable research

There is at this moment in time disagreement on almost every aspect of syllable research. This applies to the structure of the syllable, its status and also to the manner in which the syllable is constructed. This thesis will deal primarily with this last aspect of syllable research, but before we get to that stage I shall give a brief account of different ideas on the syllable through the years and of some fairly established assumptions about syllable structure.

One of the most established assumptions, sometimes even used as a definition, is that a syllable is what *syllable* has three of.[11] Yet, even this proposition has recently been challenged, for instance in the work of Kaye and Harris, under the Empty Nucleus Approach. The assumption stems from the idea that a syllable is a rhythmical unit more than anything else, and 'attached' to the superordinate unit *foot*. It therefore stresses the prosodic function of the syllable. In order to get to the essence of the syllable via this way, much use is made of the phonetic features of the syllable: "What is it that we do when we produce a syllable?".

It was thus that Stetson (1928) came to conclude that the syllable consists of what he called "chest pulses", i.e. "bursts of activity of the intercostal muscles" (Lass 1984: 248). Out of this analysis it follows indeed that there are three syllables in *syllable*, but this unfortunately says nothing about which phonemes in the word belong to which syllable. In this case, the definition can only say something about the vowels in the syllable, and nothing about the consonants.

This problem was addressed by Pike (1947). He made the distinction between the phonetic syllable, characterized by the 'chest pulse', and the phonemic syllable, which determines the possible sequences and combinations of phonemes in a language. Pike's phonemic syllable is solely dedicated to its phonotactic function. It is a tool with which the phonologist is able to predict which phoneme sequences are possible in a given language. However, as this particular function had no direct place within structuralist phonology, due to the prescriptive nature of the former and the descriptive nature of the latter, the syllable as a phonological unit, as opposed to a phonetic unit, was almost non-

[11]See for example Lass (1984: 248), who is to be credited for the expression.

existent for a long period and had great difficulty gaining ground. The rhythmical 'chest pulse', which was phonetically measurable, was for a long time the superior tool with which to prove the existence of syllables.

Even in Chomsky and Halle's *The Sound Pattern of English* (1968; henceforth SPE), the phonological syllable is ignored. Although SPE still forms the basis of present-day phonology, there are a number of points on which its analysis proved unsatisfactory. Chomsky and Halle do make use of a feature *syllabic*, meaning that a syllabic phoneme can be the centre (nucleus) of a syllable. This feature is assigned only to vowels. We find, however, that in a number of languages other phonemes, like liquids (/l,r/) or nasals (/m,n,ŋ /) can also be nuclei. For example, 'bottle' in English: /bɔtl/, and 'kopen' (to buy) in Gronings (a dialect of Dutch): /kopm/.

The prosodic function of syllables, i.e. the fact that they are a domain of stress assignment, was expressed in the list of features for vowels as [± stress]. But stress is *relative* as opposed to *absolute*; it moves about and there are more degrees of stress intensity than + and -, as can be seen in (4):

(4) *Stress shift and its scalar properties*
(relative stress depicted through figures below the words)

'guitar' and 'man'
2 1 1

but

'guitar man'
1 3 2

SPE passes over the autonomous nature of stress, because it does not recognize the domain of stress assignment: the (phonological) syllable. The difference, for example, between the stress patterns of the English verbs 'lamènt', [ləment], and 'ópen', [əʊpən], points out that differences in syllable structure (how is a syllable filled?) play a major part in stress assignment. Because of its structure, the last syllable of 'lament', /ment/, is heavy whereas the last syllable of 'open', /pən/, is light, and main stress in these English verbs is assigned to the rightmost heavy syllable (cf. Katamba 1989).

A forceful plea for the relevance of the syllable came from Fudge (1969), who pointed out its function as a domain for phonological processes. Many processes take place within the syllable and are blocked or triggered by its boundaries, as opposed to the boundaries of for example the morpheme or the phonological word.[12] Examples are aspiration of voiceless stops (/p,t,k/) at the beginning of syllables in English, and Final Devoicing in Dutch and German, which devoices all syllable-final stops.[13]

Criticism of the idea to have the syllable play a role in the SPE-type rules of linear Generative Phonology was that it was not unavoidably *necessary*. Since in SPE the rules are allowed to be as long as the description of the process requires, as long as they are finite, syllable structure could be incorporated in the rules. A Final Devoicing Rule in a language wherein a consonant is syllable-final at the end of a word or when followed by another consonant, may be denoted as (5a) instead of (5b):

(5) *Final Devoicing*[14]

a. $C \rightarrow [\text{-voice}] / \_ \begin{Bmatrix} \#\# \\ C \end{Bmatrix}$ (## is word boundary)

b. $C \rightarrow [\text{-voice}] / \_ \$$ ($ is syllable boundary)

Nevertheless, Venneman (1972) points out that

> All phonological processes which can be stated in a general way with the use of syllable boundaries can also be stated without them, simply by including the environments of the syllabification rules in the formula. My contention is [...] that in numerous cases such a formulation would miss the point, would obscure the motive of the process rather than reveal it. (p. 2)

The description of Final Devoicing in (5a) would miss a generalization and would be more elaborate than the 'correct' description given in (5b). Generalization and brevity are two major goals in the framework of *Universal Grammar*, in which we have been working since the late fifties, following Chomsky.

As the attention of phonological theory moved from *describing* processes to

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[12]In his defence of the syllable as a phonological universal, Fudge (1969) points out that the morpheme is a syntactic unit, only indirectly linked to the phonological component of generative grammar. The morpheme should thus not be considered a rival for the functions of the syllable.

[13]I am aware that when I speak of these processes as triggered by certain syllable boundaries and name these as either initial or final, I already and unavoidably voice one particular opinion about syllable structure. We will, however, come back to the processes mentioned above and look at other ways of analyzing them. Until then, the reader is asked to bear with the writer.

[14]The example is taken from Hyman (1975: 192)

explaining them and from rules to representation, the syllable became recognized as an important factor in these processes.

Based on the linear *SPE* system of distinctive features, yet recognizing some of the flaws of this analysis, are two theories that were developed alongside each other in the late seventies. In *Autosegmental Theory* representations are claimed to be multilinear and the autonomy of features and segments is essential (hence ...).[15] *Metrical Theory* proposes that representations are hierarchical and works with binary branched (metrical) trees. These different theories and their terminologies will be further explained and discussed wherever necessary in this text. For an elaborate discussion of Autosegmental and Metrical Phonology, I refer to Van der Hulst (1984) and Van der Hulst & Smith (1984). These works also show how Autosegmental and Metrical Theory can be combined to create a three-dimensional representation of the interface between the phonological component of language and the morpho-syntactic component, the link being the segments.

The use of templates can be regarded as reflecting the representationist nature of phonological theory today. Emphasis lies not on rules, but on representations, i.e. structures that 'trigger' processes. The templates used in the top-down analyses discussed here are phonotactically constrained and generally more structured than the representations allowed for by bottom-up analyses.

In §3, I will discuss some analyses of syllabification and syllable structure. I will not yet go deeply into their advantages and disadvantages here, but endeavour only to explain how the different models work. The critical discussions will take place in §4 and §5.

[15]Segments as such are not recognized in all versions of Autosegmental Theory; it has been claimed that, as opposed to being elements of their own, what we call segments are nothing but the sum of their autonomous features, added together at a specific moment in time. However interesting this issue is, it is not of our direct concern here, since this thesis is to deal with the connection between the syllabic level and the segmental level and not with what lies below the latter. Contrary to the segment, the segmental *level*, of one sort or another, is recognized in all theoretical variations.

§3 Different models

§3.1 Bottom-Up

§3.1.1 Kahn (1975)

Following the system of rules and rule ordering in SPE, Kahn (1975) devised syllabification rules along the following lines:

(6) *Kahn's syllabification rules*

I) $[+\text{syl}] \rightarrow \overset{\sigma}{[+\text{syl}]}$

IIa) $C_1 \dots C_n \rightarrow C_1 \dots C_i, \; C_{i+1} \dots C_n \overset{\sigma}{V}$

($C_{i+1} \dots C_n$ is a permissible onset, but $C_i \dots C_n$ is not)

b) $\overset{\sigma}{V}C_1 \dots C_n \rightarrow \overset{\sigma}{V}C_1 \dots C_i | C_{i+1} \dots C_n$

($C_1 \dots C_i$ is a permissible final cluster, but $C_1 \dots C_{i+1}$ is not)

III) $\overset{\sigma_1}{[\text{-cons}]} \; C \; C_O \; \overset{\sigma_2}{[V(\text{-stress})]}$

IV) $\overset{\sigma_1}{C} \; C_O \; \overset{\sigma_2}{[V(\text{-stress})]}$

V) $\overset{\sigma_1}{C} \; \# \; \overset{\sigma_2}{V}$ (fast speech)

I and II are the 'real' syllabification rules, while III, IV and V are actually *re*syllabification rules. Rule I says that a syllabic segment triggers a syllable node to which it is attached. II(a) says that all consonants to the left of the syllabic segment that are able to form a permissible onset will do so and be attached to the syllable node. Kahn's notions of permissible onset and coda are based on the possible word-initial or -final consonant cluster assumption mentioned in §2.1.2.. After this, by rule II(b), the left-over consonants are attached to the immediately preceding syllable node as its coda.

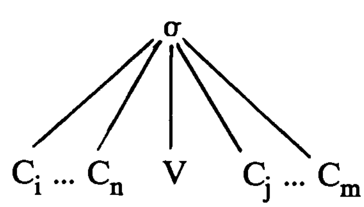
In rule III we find that an onset consonant of an unstressed syllable which is immediately preceded by a syllable without a consonantal coda will resyllabify and be attached to this previous syllable, as its coda, becoming an ambisyllabic segment. An example of the process described in III is *flapping* in English, where a /t/ can in some circumstances be realized as sounding more like a quick /d/. Only an ambisyllabic /t/ can be 'flapped'. Compare 'làtter', where flapping is possible, and 'detèr', where it is not.

IV is somewhat dubious, as the process it describes should already have happened in II(a), but it is posited to explain the non-aspirated /t/ in 'after', the explanation being that /ɑf.tər/ is resyllabified as /ɑ.ftər/, because the last syllable is unstressed.

Rule V introduces syllabification across word boundaries, which can be perceived in fast speech. An example is the Beatles' *Any Time At All*, where the /t/ in 'At' is aspirated, indicating it forms the onset of a syllable.

After all the rules have worked, Kahn's syllable will look like this:

(7) *Kahn's syllable*



(C_i ... C_n is a permissible onset)
(C_j ... C_m is a permissible coda)

The syllabification analysis of Kahn (1975), discussed here (though not in great detail), is a clear example of a bottom-up analysis of syllable construction. First, there are the segments and these trigger syllable nodes to which they are attached. The idea was elaborated by Clements & Keyser (1983), who put in an extra level in between the syllable node and the segments, the CV-tier, in order to express length (see §3.3).

§3.1.2 Hayes (1989)

Bottom-up are also the analyses of Hyman (1984, 1985) and Hayes (1989), in which an element expressing phonological wheight, the *mora* (μ), plays an important part in syllable structure. The 'moraic' models form an alternative to 'segmental' models, which make use of constituents (like onset and rhyme) in syllable structure. I will limit my discussion here to the model proposed by Hayes (1989), which is based on the analysis of Hyman (1984, 1985).

The mora is a unit expressing phonological weight. One mora makes a phonologically light syllable and more moras make a heavy syllable.[16] The assignment of moras depends on the segments in the string. Syllabic phonemes (I will only take vowels in the examples) are assigned a mora underlyingly. In languages with contrastive vowel length, long vowels are assigned two moras and short vowels one mora (Hayes 1989:256):

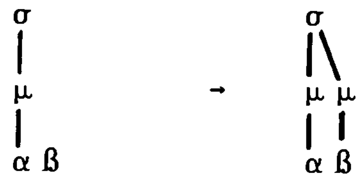
```
(8) a.   μ  μ                  b.   μ
         | /    = /iː/              |     = /ɪ/
         i                          i
```

These moras are dominated by the syllable node. In Hayes' words: "... certain sonorous segments [are selected], on a language-specific basis, for domination by a syllable node." Next, the onset consonants are bound to this syllable node. Onsets have no influence on syllable weight and are therefore not attached to moras, but directly to the syllable node. Coda consonants are bound to the preceding mora.

Syllable weight based on structure differs language-specifically, which leads to the claim of Moraic Phonologists that moraic structure of languages can vary. For example, in languages like English and Latin, closed syllables (CVC) count as heavy, whereas in others, like Lardil, CVC counts as a light syllable. Hayes posits a *Weight by Position Rule* that is present in some languages (English, Latin, Dutch), but not in all.

[16] In the beginning of his article (p. 259), Hayes claims that a syllable can maximally consist of two moras. Otherwise the model would become too 'free', i.e. not restrictive enough. However, later in the article (p. 291), we find that Hayes' analysis does need to make use of syllables with three moras, in order to describe certain language-specific processes.

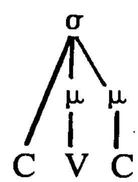
(9) *Weight by Position*

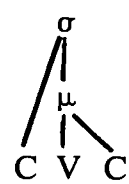


where σ dominates only μ

In languages where the rule works, codas are assigned moras 'of themselves'. In other languages they are the daughters of preceding moras. The difference between Latin and Lardil in CVC-syllable structure is shown in (10).

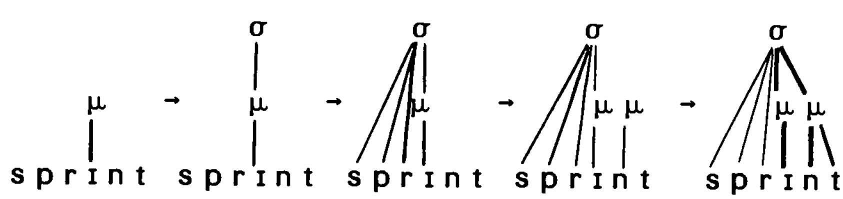
(10) a. *Latin* b. *Lardil*





Step by step, the syllabification process looks like this:

(11) *Syllabification in Moraic Phonology*



Hayes' Moraic Phonology thus incorporates weight into syllable structure. It makes use of a language-specific Weight by Position Rule for the explanation of variety in weight between similar syllables cross-lingually.

Unfortunately, there is one theory-internal flaw in Hayes' model, brought to the attention by Noske (1992). I feel it needs to be repeated here. Hayes uses the notions *spreading* and *dumping*, taken from autosegmental theory (cf. §3.3), but an essential constraint in this theory is that of *planar tier locality*. It says that

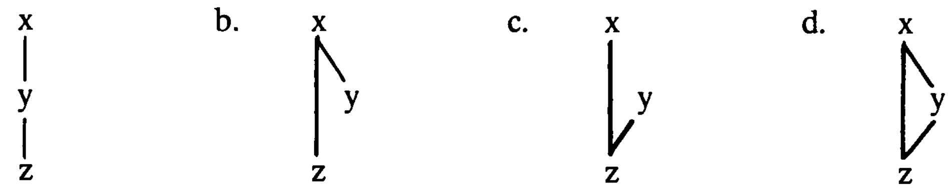
> elements of a given set can only be linked with members of one other *single* set of elements above them and another *single* set of elements below them. (Noske 1992:49)

This constraint is based on the *Strict Layer Hypothesis* of Selkirk (1984):

> A category of level i in the hierarchy immediately dominates (a sequence of) categories at level i-1

If this constraint is not obeyed, the theory is not sufficiently restrictive, as it will then allow for the skipping of levels of representation with the result that all sorts of linkings that are to be avoided become possible. Examples of possible linkings are given in (12) and are taken from Noske (1992:50, in part). Only (12a) is and should be permitted in an autosegmental model where planar tier locality works.

(12)a. b. c. d.



We have seen that in Hayes' proposal syllable-initial consonant sequences link directly to the syllable node, whereas all other segments are linked to the moraic level first. This is to express the observation that onsets have no influence on syllable weight. Because the model does not obey the 'simple' but essential autosegmental constraint of planar tier locality, while it does have other autosegmental characteristics, Hayes will need a number of random extra-theoretic stipulations to rule out e.g. skipping of the moraic level by codas and nuclei.

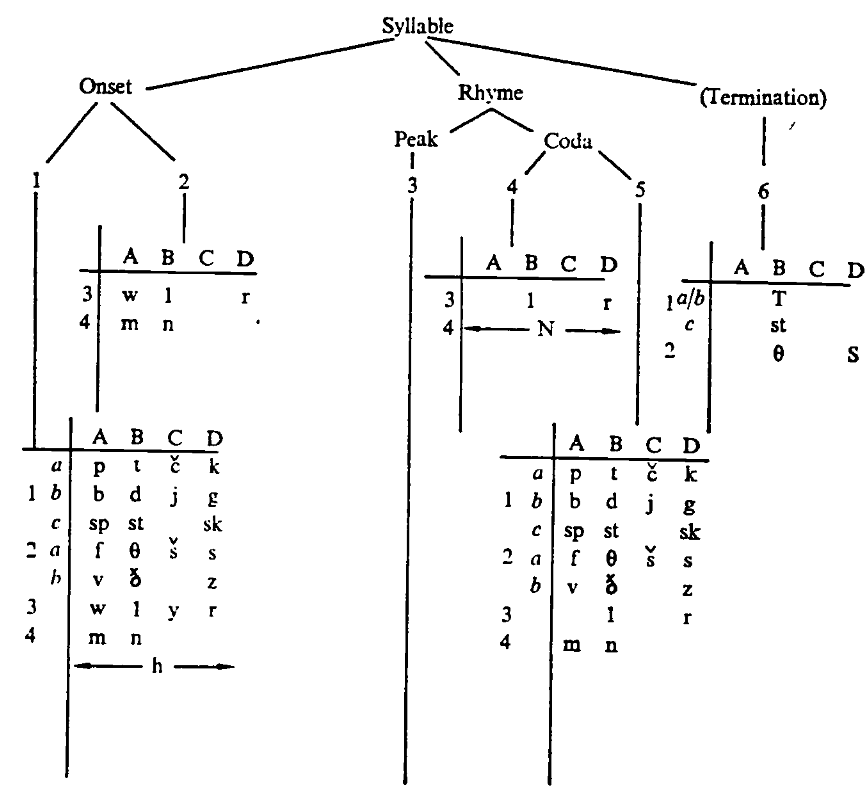
Nevertheless, Moraic Theory has been a major influence in phonology and has been shown to be able to account for a range of phonological processes (cf. §4.2), so it is not to be waved away as having simply been proven wrong.

§3.2 Top-Down

§3.2.1 Fudge (1969)

In the same article in which he defended the status of the syllable as a phonological universal, Fudge also proposed a syllable template for English - a model of possible syllables which works Top-Down. Fudge's template is literally a model of possible syllables in English. All the positions in the highly structured template are subcategorized for the phonemes they can contain. Basically, all English syllables should fit into this model, but some minor exceptions need to be allowed for the model to work. The template is shown in (13).

(13) *Fudge's syllable model for English*



	x α	x β	y α	y β	z α	z β
I	i	ʌ	ī(ai)	ʌ̄ (yu:)		
II	e	u	ē(i:)	ū(u:)	au	oi(ɔi)
III	a(æ)	o(ɒ)	ā(ei)	ō(ou)	a:(ɑ:)	ɔ:

In this template, the onset and the coda contain two positions. "Place 6 is used in word-final syllables only, and may be occupied by one of the members of the system operating there, or by a string of two (exceptionally three) of these members" (Fudge 1969:269). This position is called 'termination' here, but it is also known as 'appendix'.

Place 4 is a rather controversial position. It can contain liquids (/l,r/) and nasals. Fudge claims it to be a dependent on the coda, but it has also been said to be a satellite of the peak (e.g. Cairns and Feinstein 1982, Van der Hulst 1984, Gilbers 1992) or a 'floating' position (Trommelen 1983). Long vowels and diphthongs are treated as single phonemes by Fudge. Therefore, they only occupy one position - the peak.

Fudge also treats sC-clusters (i.e. /sp/, /st/ and /sk/) as single phonemes. That is why he only needs two positions in the onset. So, in a syllable-initial CCC-cluster, which can only be sCC, the first two consonants (sC) are in fact one and consequently occupy only one place, namely place 1. Analogously, post-nuclear sC-clusters can occupy place 5 as one phoneme. Cluster /st/ is the only cluster found possible in place 6, the termination, although the quote above tells us that this place may be occupied by a longer string of its possible members (of which /st/ is one). It is important that a string should not be confused with a cluster.[17]

In the words of Selkirk (1982:344): "[Fudge's] template and the accompanying set of phonotactic constraints [...] together specify all the possible syllable types of the language and can be thought of as serving as well-formedness conditions on the syllabic structure of the phonological representations of a language". Yet, it is also obvious that the model is highly under-restrictive. According to the template, monsters such as /spmilstθ/ and /jnɛɪr/ should be considered well-formed English syllables, while we can rest assured that they are not. Nevertheless, Fudge's template was a major step towards a correct formalization of the phonotactic function of the syllable and is still influential after two and a half decades.

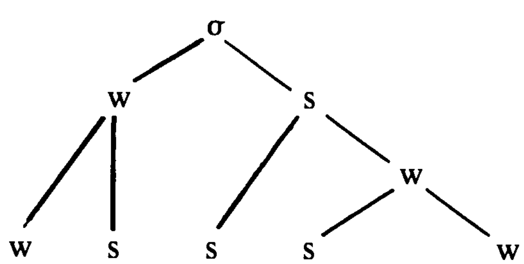
[17]For a different analysis of sC-clusters see a.o. Ewen (1982:46-51), who also deals with Fudge's analysis.

§3.2.2 Cairns & Feinstein (1982)

Before I go on to discuss the model proposed by Cairns & Feinstein (1982), I will give a short account of its background.

Based on the sonority slope is the following syllable template proposed by Kiparsky (1979).

(14) *Kiparsky's Universal Hierarchy*

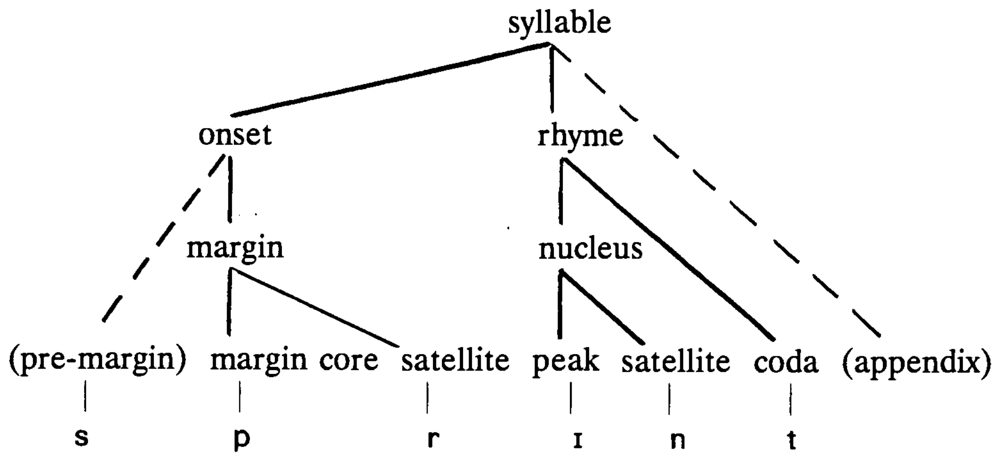


on the same level, *s* is more sonorant than *w*

The daughter of an *s*-position is stronger than the daughter of a *w*-position, so the middle *s* is the strongest, most sonorant element of the universal syllable. The segments then fall into place as balls through a vertically placed maze.

The prominence and dependency relations in Kiparsky's model are exemplary of Metrical Phonology. This theory was initially developed to deal with phonological *stress* (cf. a.o. Liberman 1975, Vergnaud & Halle 1978), but later extended to other phenomena. Kiparsky was the first to apply it to syllable structure. This idea was used by a.o. Cairns & Feinstein (1982), who, however, did not incorporate sonority in their template, which is shown in (15).

(15) *Syllable model Cairns & Feinstein (1982)*



Model (15) represents a hierarchical organization of the segment distribution within a syllable. Vertical lines indicate the head of a branching constituent, whereas slanting lines indicate the dependent parts, the optional parts of the dominating constituent. This top-down construction incorporates an internally structured onset. The margin core position is the head position of the margin, which in its turn is the head position of the onset. The satellite is the dependent part of the margin core and the pre-margin is the dependent part of the entire margin. All positions are phonotactically constrained. For instance, only sonorants may fill satellite positions and there are no vowels allowed in whichever onset position. According to most syllable theories, the pre-margin position is restricted to /s/, although there have been proposals to extend the number of possible pre-margin segments with /p,t,k/ (cf. Trommelen 1983, Gilbers 1992).

§3.3 Noske (1992)

Alongside Metrical Theory, there is also Autosegmental Theory. Autosegmental Theory works with *tiers*, which may be regarded as levels. In the domain of syllables, the simplest view is that there is a syllabic tier, on which all the syllable nodes are put next to each other, and, below that, a skeletal tier. The skeletal tier 'houses' slots to which the segments are associated.[18]

One view of slots is that they are completely unspecified units, represented by the symbol 'X'. Another is that we have two types of slots, normally represented by the symbols 'C' (consonants) and 'V' (vowels). The difference between these two views is important. The latter view works with subcategorized slots on the skeletal tier, meaning that a specific segment can or cannot be associated to a specific slot, depending on whether it corresponds to the category of the slot, while the first view makes no distinction between segments on that level. As opposed to working with specified slots, the X-slot view works with specified nodes; certain segment types (for example vowels) can only be associated to a slot that is dominated by a certain node (for example "nucleus", e.g. Van der Hulst 1984:41). If the syllabic theory is top-down, an onset consonant (cluster) will thus drop into onset position, simply because it is an onset.

A third approach has the terminal nodes specified for certain features, for example sonority (Van der Hulst 1984). These features then generalize over the vowels and consonants.

Autosegmental Theory allows elements linked to slots on higher-level tiers to have *wide scope* or *narrow scope* on those slots. In terms of segments and the skeletal tier, this means that a segment may be associated to two slots on the skeletal tier (wide scope) or that two segments may be associated to one slot on the skeletal tier (narrow scope). For example, a long vowel, such as /i/, will be represented as one segment, be it /ɪ/ or something else, linked to two V- or X-slots on the skeletal tier, while a complex segment, such as /c/, will be represented as two segments, say /t/ and /ʃ/, linked to one skeletal slot.

Related to this is the fact that Autosegmental Phonology has four major principles, the first three of which are pure association conventions:

[18]Some autosegmental theorists speak of a third, segmental tier, while others claim that the features that make up the segments are directly linked to the skeletal tier, without an intervening level. This issue is, however, of no considerable importance here, as we are dealing with the structure of syllables, which consist of what we call segments, and not with what comes lower on the hierarchical scale discussed in §2.1.1. For further insight into this discussion, see Goldsmith (1979)

(16) *The Principles of Autosegmental Phonology*

(tier A is one tier below tier B)

a. **Mapping**
Insert association lines between one element on tier A and one element on tier B - going from left-to-right/right-to-left - starting with the leftmost/rightmost elements.

b. **Dumping**
Leftover elements on tier A are associated to the nearest element on tier B to their right/left.

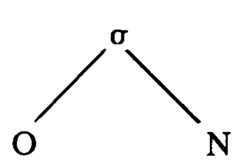
c. **Spreading**
Leftover elements on tier B are associated to the nearest element on tier A to their left/right.

d. **Default Value Assignment**
Leftover elements on tier B trigger and are associated to a (language-specific) default element on tier A.

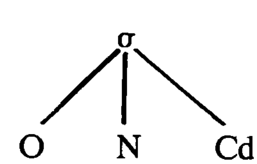
It will be immediately clear that spreading and default value assignment do not go together; they complement each other, and even this does not have to be the case. Apart from mapping, the principles of Autosegmental Phonology do not apply to all languages or processes. It is therefore possible that, for example, in certain languages neither spreading nor default value assignment occur, but only mapping and dumping. The choices are language-specific and the principles of Autosegmental Phonology are in that sense parameters of Universal Grammar.

Autosegmental Phonology forms the framework for the *True Constituent Model* proposed by Noske (1992). In this model, Noske makes use of subsyllabic nodes, such as onset, nucleus and coda, to which the segments are associated. He distinguishes two types of syllable templates: binodal (17a) and trinodal (17b):

(17) a.



b.



The choice between structure (17a) or (17b) is language-specific.[19] The subsyllabic nodes contain subcategorization features:

> An onset node can only be mapped to a consonant (or glide), a nucleus node can only be mapped to a vowel (or, inasmuch as the language permits, e.g., syllabic liquids and nasals, also to liquids and nasals). (Noske 1992:30)

The non-directional association convention mapping allows Noske to circumvent the choice between a bottom-up or a top-down approach to syllable construction. This is in accordance with an observation by Lowenstamm and Kaye (1985), who write:

> In most studies . . . the prosodic/accentual level of representation is viewed as basically interpretive of the segmental representation, i.e. prosodic structure is erected according to properties of the segmental string. . . . If, however, the two levels of representation . . . are truly autonomous, one would expect that their interaction would not be limited in such a way. Indeed one would expect that the prosodic level will in turn determine certain aspects of the segmental representation. It is our contention that major aspects of prosody are determined in just that way, specifically on the basis of the geometrical properties of prosodic structure. (98)

Noske's analysis of syllabification, called *Syllable Assignment Theory*, is as follows:

> **Syllable Assignment Theory**
> The string of segments is scanned for nonsyllabified segments in a directional way (RL or LR). If a nonsyllabified segment is encountered, a syllable of the canonical shape is superimposed onto the string of segments. Then, optimal linking between the segments and segment bearing units takes place, according to the general conventions of autosegmental phonology. Then the scanning process begins again, etc. (1992:20)

The start of the syllabification process is Bottom-Up, in the sense that in the beginning there are only the segments. However, the use of a template is Top-Down; it is "superimposed onto the string". The association between the two happens at first through mapping, which is non-directional, while resyllabification takes place through the other three Autosegmental principles in Bottom-Up as well as Top-Down directions, depending on the language and sometimes even on the type of process.

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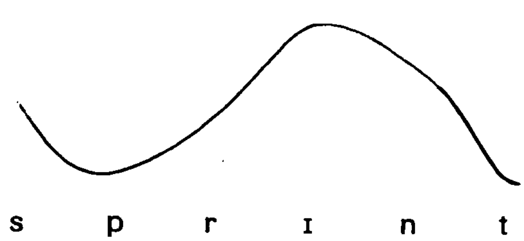
[19]Noske (1992:26) provides an example of a case where different syllable templates are triggered by different phonemes. In order to give an explanation for the fact that schwa-syllables are the only exception to the general observation that there are no short open syllables in German and Dutch, Noske claims that the *schwa* (/ə/) is the only phoneme that triggers a binodal syllable in these languages, while German and Dutch syllables are generally trinodal.

§3.4 Harris (1994)

In this section, I want to discuss a fairly recent proposal for syllable structure that is elaborated in Harris (1994). Although it is sufficiently interesting to be paid great attention to, it will not play a major part in this thesis, the main goal of which is to compare analyses that differ mostly with respect to direction of syllabification. Harris' proposal is too different from the (more conventional) others discussed in this chapter to be simply compared with them within the scope of these pages. Such a comparison would be a topic and a project of research of its own. However, I feel that the theory laid out below should not be ignored in a thesis dealing with syllables. What I will do is refer to Harris' proposal when required or interesting and deal with it in separate sections (e.g. §5.1), but I will not put it to the same test as I will the others in §4. The explanation of Harris' proposal involves a number of unavoidable 'new' terms and concepts and the pace in this section will be hotter than in the rest of this work. However unfortunate, this is for reasons of economy and for those described above.

Harris works within the Empty Nucleus Approach (ENA) (Kaye, Lowenstamm & Vergnaud 1990), mentioned in §2.1.2. The starting-point of this approach is that the opposite assumption, i.e. that syllables must at least have a filled nucleus, has no phonological basis at all. Consider the sonority slope (§2.1.2) of a word such as *sprint*:

(18) *Sonority Slope of* /sprɪnt/



The /s/ in the onset is of a higher sonority level than the /p/ it precedes. This goes against the observation that, normally, the sonority level of syllables rises towards the peak, on both sides of that peak. If we follow this traditional assumption, this means that /s/ in *sprint* probably belongs to a different syllable than the one of which /ɪ/ is the peak. Harris claims that this is indeed the case and underpins this claim with his observation that such (seemingly) tautosyllabic onset clusters sCC only occur at the beginning of morphemes, and never within a morpheme. Within Harris' framework, word-internal segments that are split by a morpheme boundary "cannot automatically be considered adjacent in terms of constituent structure" (Harris 1994:50). Even stronger: "... two segments separated by a word-level (morpheme) boundary are never syllabified within the same constituent" (51).[20] Thus, strings that are constructed from an underived lexical item (e.g. *cat*, *brown*) with or without a root-level morpheme (e.g. Latinate affixes) are non-analytic domains, whereas word-level morphology (compounds, regular Germanic affixation) always makes the string analytic by creating domain barriers. Assuming these barriers, there is a discrepancy between the occurrence of consonant clusters morpheme-initially and morpheme-finally.

Another argument is the following. When /u/ is preceded by a simple onset C in conservative (southern) English dialects, there is a possible insertion between the two of the segment /y/. This also applies when C is /l/. Yet, when the onset is Cl, as in /blʊ:/, this insertion does not take place.

(19) */y/ insertion* (adapted from Harris (1994:61))

a.	**/Cyʊ/**	b.	**/lyʊ/**	c.	**/Clʊ/ (*/Clyʊ/)**
	cute		lieu		blue
	music		lewd		clue
	tune		lucid		plumage
	suit		luminous		glue

This leads to Harris' claim that the maximal onset in English, and indeed universally, is a CC-cluster. When /y/-insertion takes place, /y/ occupies the second slot of a two-slot onset. In *blue*, it cannot, because the onset is already maximally filled.

If onsets have a maximum of two positions, /s/ in *sprint* belongs to a separate syllable, which can only be one with an empty nucleus. "Only a voiceless coronal fricative can occur in [the first position of a word-initial three-consonant cluster] - in English, [this is] /s/" (p. 54). In languages such as English and, for that matter, Dutch, this first nucleus

[20]There is counterevidence to this claim: In Dutch, *aardappel* (potatoe), consists of two morphemes, *aard* and *appel*. *aard* as a separate syllable is pronounced /a:rt/, due to the Final Devoicing process that occurs in Dutch. *aardappel*, however, is pronounced /a:rdɑpəl/, showing that the word is syllabified *aar.dap.pel*. Also, in English, aspiration of /k/ in *weekend* seems to point to a syllabification of the word as *wee.kend*, while its morphological structure is *week+end*. Harris' claim as cited here may therefore be considered to be too strong.

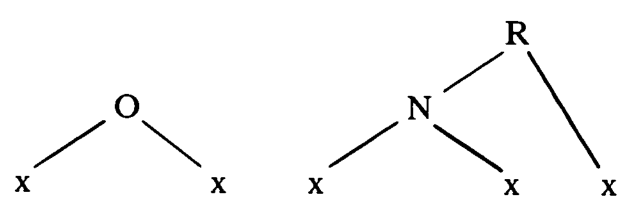
is not phonetically interpreted, i.e. it is empty, as opposed to languages such as Spanish, where it does have to be interpreted phonetically (comp. *Spain* (Eng.) /spein/, *Spanje* (Dutch) /spɑnyə/ vs. *España* (Span.) /ɛspɑña/).

Harris extends the claim that onsets are maximally two-slot to the other constituents of the syllable. He recognizes the onset, the rhyme, and the nucleus. These are the constituents that may branch, binary and only once.

A similar argument as that provided above for the maximal binarity of onsets is given for Harris' claim that there may really be only one syllable-final (coda) consonant. More complex consonant sequences that seem syllable-final only occur word-finally - compare *mint* and *win.ter*. The extension of this argument is that /t/ in *mint* also belongs to a separate syllable with an empty nucleus. In fact, all word-final consonants form the onset of an empty-nucleus syllable. The Maximal Cluster Approach (cf. §2.1.2) is firmly abandoned.[21]

Furthermore, it is noted that when we speak of syllable weight, we really mean the weight of the rhyme, as onsets have no influence on weight. Onsets, therefore, "are not projected to higher levels of the prosodic hierarchy" (p. 159), and are not directly attached to the rhyme nodes. This means that the 'syllable' as such is not recognized as one phonological domain, or autonomous constituent; it does not form a whole. "Instead, . . . segment strings are organized into iterated constituent pairs consisting of an onset followed by a nuclear projection" (p. 160).

(20) *Harris' Maximal Syllable*



When both the rhyme and the nucleus branch, we get the sequence [VVC] and speak of a super-heavy rhyme. According to Harris, this is extremely rare in English and he formulates conditions on when it *can* occur (Harris 1994:77). Words such as *beat* are syllabified as /bi:.t/.

[21]For further extensive arguments against the MCA, of which there are quite a large number, I refer to Harris' work itself.

The relations between the different constituents of Harris' 'syllable' are defined in terms of *Phonological Licensing* (a.o. Selkirk 1981). Licensing is a principle taken from syntactic theory, where the presence of each node in sentence structure has to be sanctioned or licensed by the presence of some other node. In general, it says that each unit in a hierarchical representation is required to belong to some higher order structure. When it does, the unit is 'licensed'. For example, segments must be linked to skeletal slots, or syllabic constituents, depending on the syllable theory one adheres to. If they are not, the segments are not phonetically interpretable, and 'deleted' by *Stray Erasure* (see a.o. Itô 1986).

Constituents, such as onsets, nuclei and rhymes, are *headed*. This means that one daughter of a (branching) constituent node is obligatorily present, while the other is only optionally so. In a rhyme, the nuclear **position** is obligatory, while a coda is optional - the nucleus is the head of the rhyme.[22] Rhymes are thus left-headed. Harris shows with similar arguments that nuclei and onsets are also left-headed.

Under prosodic licensing, a position is licensed by the head of which it is a complement. Within a domain, the only unit that does not have to be licensed is the head of that domain. In our domain, this head is the nucleus. Within constituents, licensing relations are head-initial, which is similar to saying that constituents are left-headed. So, nuclear heads license their nuclear complements, while the left slot of an onset licenses the right slot. Coda's are not complements of the nuclear head, but adjuncts. They can be licensed by a nucleus, but only when the nucleus does not branch, otherwise there is a position between the nucleus and the coda, while licensing requires adjacency (locality). In superheavy rhymes, therefore, the coda adjunct has to be licensed by some other unit. On the other hand, coda's cannot be present without a preceding nuclear position, as the rhyme node to which they are attached is a *projection* of the nuclear head.

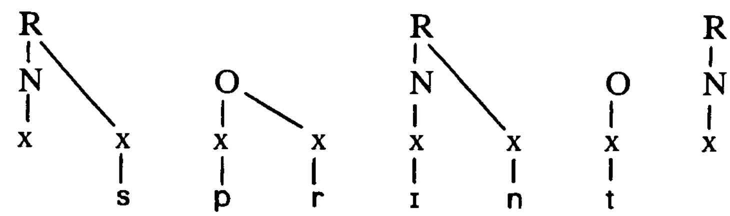
Between constituents, licensing relations are head-final. Nuclei thus license onsets,

[22]Note that it is only the position that is claimed to be obligatorily present. It does not have to be filled. This formulation reflects the idea that for a syllable to be present, there must at least be a nuclear position, whether empty or filled.

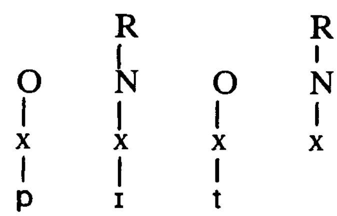
and an onset licenses the coda-consonant of a preceding syllable.[23] Note that this means that the coda in a normal heavy rhyme is doubly licensed, once by the adjacent nucleus and once by the following onset.

Returning, then, to *sprint*, the complete representation according to Harris (1994) is given in (21a), while, for clarity's sake, the representation of *pit* /pɪt/ is given in (21b). Licensing relations are indicated by arrows. Straight vertical lines indicate heads, while dependents are linked to the nodes with slanting lines.

(21) a.



b.



On the subject of bottom-up or top-down syllabification, Harris expresses himself quite clearly:

> Whichever of these views of syllabification is adopted, this much is clear: constituent structure must be established before forms are submitted to derivation. This conclusion is based on the observation that many types of phonological structure must either be present lexically, as assumed under the template approach, or be constructed 'first thing' before phonological processes proper come into operation. This point means that any pair of templatic and algorithmic accounts that incorporate the same general principles and language-specific constraints are probably no more than notational variants. (84)

In personal communication, Harris is wont to claim that "nothing happens bottom-up." However, since this thesis *is* concerned with these "notational variants", it would be satisfying to be able to categorize Harris' proposal more clearly in terms of direction of syllabification. The following problem arises. The model resembles Noske's (1992)

[23] Harris remains vague on the level where the projections of onsets meet those of nuclei, but it is probably on word-level.

Syllable Assignment Theory, in that the nucleus is the ultimate, or rather first licensor. Without a nuclear position, there is nothing. Yet, in a string of (phonetically interpreted) segments, it is impossible to recognize an empty nuclear position. Therefore, by deduction, top-down seems to be the only possible direction of syllabification in this framework.

§3.5 Time Out

The different analyses I have chosen to discuss in this chapter must be understood to be only a sample of a far wider range of theories and analyses. However, although it is by no means complete, I believe that the list of models above forms a good representation of the varying ways in which theorists have chosen to analyse syllable structure and syllabification. The advantages and disadvantages of the characteristics of these models will be discussed below (§4), after which we will try to find out how the problems might be solved.

§4 To the test

In this chapter, I will discuss the merits and problems of the separate analyses I have taken as examples in chapter 2, particularly with respect to the phonological processes of *cluster reduction* (henceforth CR) and *compensatory lengthening* (henceforth CL). These particular processes are chosen because they seem to represent exactly the two sides of what should be the same coin. As I will show, CR appears to be triggered by prominence in structure (a characteristic of top-down templates), while CL appears to become possible through a fundamental freedom in phonotactic constraints on syllable structure (a characteristic of bottom-up analyses).

To some readers, the following discussion may seem somewhat negative, in the sense that I will often focus on what a theory can*not* do, instead of on what it *can* do. Unfortunately though, this way of working remains essential. A theory, any theory, should be able to provide insight and explanation for everything in its domain. Of course, exceptions remain, but a theory that claims to cover a particular domain, must account for the regular processes that occur in it, or claim an (unlikely) overlap with an area subjected to the rules of a competing theory. Hence the pointing out of flaws.

The emphasis in the following discussion will lie on the distinction between bottom-up and top-down analyses, but this does not mean I will not deal with models in detail. Not all models discussed in chapter 2 will be discussed here, mostly for reasons of redundancy.

§4.1 Bottom-up vs. top-down with respect to CR

Within the framework of Generative Phonology, it is generally assumed that a child acquires the ability to produce the phonological characteristics of its mother tongue step by step. Any acceptable phonological representational model that fulfills the UG-hypothesis should be able to indicate the different stadia the child passes through. Therefore, data of first language acquisition are a good means of testing concurring representational models. Consider the data in (22). The data in (22a) were obtained from spontaneous speech and from games in which the child repeats an adult.

(22) a. *CR-data Steven*

age:	target:			realization:
1;3	bloem	[blum]	'flower'	[bub]
	al klaar	[ɑlklar]	'already ready'	[ɑka]
1;8	fruithap	[frœythɑp]	baby food	[fœyta:]
	kraai	[kraj]	'crow'	[kaj]
1;9	klok	[klɔk]	'clock'	[kɔk]
	brood	[brot]	'bread'	[pot]
	stoel	[stul]	'chair'	[tuw]
	broem	[brum]	onomatopoeia	[bʊm]
	brrroem	[br:um]	onomatopoeia	[bʊm::]
1;11	grote (auto)	[χrotə]	'big (car)'	[hotə] [xotə]
	trap	[trɑp]	'stairs'	[tɑp]
	drie	[dri]	'three'	[di]
1;11	twee	[tʊe]	'two'	[te]
2;0	schaap	[sχap]	'sheep'	[be] [χap]
2;2	gloria	[χlorija]	'gloria'	[xotija]
	zwarte piet	[zʊɑrtəpit]	'St. Nicholas' servant'	[sɑtəpit]
	(sinter)klaas	[klas]	'St. Nicholas'	[kas]
2;5	Mogli	[mogli]	name	[moki]

b. *CR-data Leonie and Jarmo* (Fikkert, 1994:87)

Leonie (1;9)	slapen	[slapən]	'to sleep'	[lapə]
Jarmo (2;3)	slapen	[slapən]	'to sleep'	[lapə]
Jarmo (2;3)	slapen	[slapən]	'to sleep'	[sapə]

The data in (22) exhibit examples of children who are unable to produce complex onset clusters. Yet, they omit onset segments neither at random nor at fixed positions. In e.g. *stoel* and in *schaap* the first onset segment is omitted, whereas in *brood* and in *klok* the second is. The crucial example is *slapen*, which is sometimes produced with deletion of the first (Leonie, Jarmo) and sometimes with deletion of the second onset segment (Jarmo).

It appears to be very difficult to account for these data in a bottom-up construction of the syllable, such as in Kahn (1976) or in Hayes (1989). The reason is that these models do not distinguish hierarchical structure within the onsets. In Kahn all segments to the left of the attached syllabic segment that satisfy the maximal onset constraint are linked to the syllable node by rule R2a. There is no intermediate level of representation and no means of explaining why particular segments in the onset seem to be more prominent than others. In moraic theory (e.g. Hayes 1989) the consonants to the left of the first mora are weightless and, therefore, directly attached to the syllable node. So, in both theories a mutual hierarchical ordering of the onset segments is absent, which makes it virtually impossible to provide an account of the divergent CR data in (22).

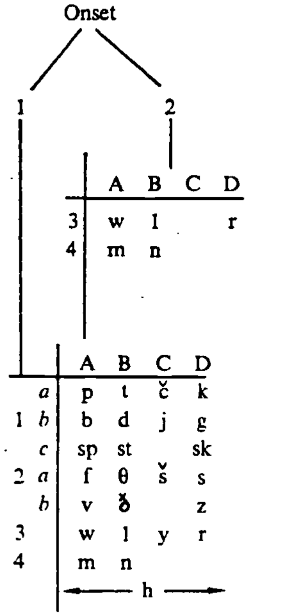
In order to see how CR data might be accounted for in the phonotactically constrained model proposed by Fudge (1969), we have to look at English data, as Fudge's template is highly language specific and his proposal is specifically for English.

(23) *English CR data (Smith 1973)*

target	realization	age (years.days)
black	[bæk]	2.60
	[bæk]/[blæk]	2.189-196
bridge	[bɪt]	2.139-144
drive	[daɪv]	2.156-157
flag	[wæg]	2.164-175
friend	[wɛn]/[wɛnd]	2.115
queen	[gi:m]	2.164-175
	[ki:m]/([ki:n])	2.198-203
school	[gu:]	2.156-157
	[ku:l]	2.219-227
scramble	[kæmbəl]	2.275-285
slightly	[laɪdi:]	2.189-196
smack	[mæk]	2.275-285
spread	[prɛd]	2.317-333
squeek	[ki:k]	2.275-285
tube	[du:b]	2.219-227

If we map the data in (23) onto Fudge's template, the onset of which is repeated in (24) for the sake of conveniency, the pattern seems consistent.

(24) *Onset (Fudge model)*



In the reduced clusters of two consonants, it is always the consonant occupying place 1 in the template that is realized, while the consonant in place 2 is deleted. Note that this is only a regularity that is by no means directly explained, as Fudge did not incorporate some type of prominence in his model. Nevertheless, it is quite possible to adapt Fudge's phonotactically constrained template in such a way that the said regularity will follow from the structure of the model, for example through tree-headedness.

The real problems for Fudge's proposal concern the phoneme /s/. In Fudge (1969), sC in sCC-clusters is treated as a single phoneme, which means that, in the CR-data above, we suddenly find the realization of half a phoneme when sCC-clusters are reduced. This seems highly unlikely. The biggest problem, however, is formed by the realization of 'smack' and 'slightly' as /mæk/ and /laɪdi:/. Here, we see that in Fudge's template the phoneme in place 2 is realized, while the phoneme in place 1 is not. This is not consistent with the observation above that in almost all other cases it is the phoneme in place 2 that is not realized when a cluster is reduced.

These phenomena might be explained by the fact that /s/, a fricative, is one of the most difficult phonemes for children to acquire and use distinctively (cf. Ingram 1989). This explanation would be supported by the observation that the child from whom the data are taken seems to have trouble with /s/ in general. The /s/ in words such as 'sit', 'mouse', 'zoos', 'size', 'see', 'saw' and 'sock' is realized as many varying phonemes, for example as /r/, /l/, /d/, /w/, /g/, or /t/ (Smith 1973). In onsets, simple /s/ is not deleted but always realized as another phoneme. The child is clearly 'confused' where it finds an /s/ on its way.[24]

Now, focus on the onset of the Cairns and Feinstein template in (25) and see how the data in (22) fit in. Remember that the satellite position can only be filled by sonorants and that the pre-margin position is generally assumed to be restricted to /s/.

(25) *Onset (Cairns and Feinstein model)*

(pre-margin)	margin core	satellite	
s	t		ʊl
s	x		ɑp
	b	r	ɔt
	k	l	ɔk
s	l		apə
	s	l	apə

The model logically predicts that a child first acquires the head positions. They are the most prominent. Therefore, a child that is unable to produce complex onsets will realize the segment in the margin core position first and omit the segments in satellite and pre-margin position. In *broem*, /b/ obtains the margin core position and the sonorant /r/ the satellite position. Taking this into account, it comes as no surprise that the dependent /r/ is not realized. In *stoel*, on the other hand, /t/ cannot fill the satellite position, since it is not a sonorant. Therefore, /t/ has to be situated in the head position and /s/ in the pre-margin. The model correctly predicts that the child realizes *stoel* as [tul] (here: [tuw]). The most interesting case is *slapen*. The model allows for two different parsings of this word: one with /s/ in the head position and /l/ as the satellite and one with /l/ in the head position and /s/ in the pre-margin. It seems as though the model is not restrictive enough and that it consequently overgenerates. However, the data show that both possible realizations are indeed present: [sapə] and [lapə]. Thus, the model predicts that for a word such as *slapen* two possible realizations are possible, whereas the realization of *stoel* as [sul] is ruled out. Note that Steven, Leonie and Jarmo, from whom

[24] For reasons of economy and clarity, I have not dealt with the observed realization of 'flapjack' and 'flower' as /læpgæk/ and /læwə/, respectively, in the data in Smith (1973). I believe that this realization is due to the fact that in this stage of the acquisition process, this child 'mixes up' the fricative sounds, which are hardest to acquire. It uses the /f/ as if it where an /s/ and it cannot use the /s/, so the sound is not realized.

the data in (22a) are taken, have apparently already acquired /s/, in contrast with the child that provided the data in (23).

In the *true constituent model* proposed by Noske (1992), there is no place for the representation of prominence relationships such as we have seen in the model of Cairns & Feinstein. It is Noske's own argument against the moraic model proposed by Hayes (1989) that this would constitute a theoretical mix-up of Metrical Phonology, with hierarchical binary branching, and Autosegmental Phonology, with levels of representation that cannot be skipped (see section 4.2). However, it will be clear that the result of this characteristic of autosegmental syllabification is that it cannot account for the CR-data discussed in this section by means of prominence relationships.

At this point, we may conclude that top-down models, which exhibit more internal structure, are better equipped to account for CR-data than bottom-up models and that the middle way does not stand the test either.

§4.2 Bottom-up vs. Top-down with respect to CL

CL is conventionally defined as lengthening or gemination of a segment as compensation for the deletion of another segment. The classical example is Latin *kasnus* 'grey', which changed into [ka:nus] with a lengthened first vowel that compensates the loss of /s/. A further typology of various instances of CL is given in Hayes (1989). He mentions 7 types:

(26) *Different Types of CL (Hayes 1989, 279-81)*

I	'Classical'	ɑsta → a:ta
II	Double Flop	ɔdwɔs → o:dɔs
III	Vowel Loss	tɑlə → ta:l
IV	Glide Formation	tɪɑ → tya:
V	Total Assimilation of Consonants	ɑsta → ɑs:a / ɑt:a
VI	Prenasalization	ɑ m b ɑ → a: mb ɑ
VII	Inverse CL	a:kɑ → ɑk:ɑ

This typology, however, does not include a type of CL that is the result of deletion of -in Cairns & Feinstein terms- the nuclear satellite in a closed syllable. Consider, for example, the data in (27) which exhibit CL as the result of the loss of a segment in nuclear satellite position.

(27) *CL in Western Dutch dialects* (Gilbers 1992:174)

a. Standard Dutch:		b. Western Dutch dialects:	
Cruyff	[krœyf]	[krœ:f]	'Cruyff'
kuis	[kœys]	[kœ:s]	'chaste'
lijf	[lɛɪf]	[lɛ:f]	'body'
koud	[kɔut]	[kɔ:t]	'cold'
mens	[mɛns]	[me:s]	'human being'

Indeed, apart from the reference in Gilbers (1992), this process does not seem to be recognized at all in the literature. As I will show below, however, it will prove to become particularly interesting for our test. For reasons of economy, I will deal here only with this 'nuclear satellite' type of CL and with the 'classical' type.

In the first language acquisition data of Steven, we also observe examples of CL. For instance, *bal* 'ball' is sometimes realized as [ba:]. In this realization the deletion of /l/ is compensated by lengthening of the preceding vowel: the same type of CL as that which occurred in the classic example of *kasnus*. Furthermore, the data in (28) exhibit the example *fruithap* [fœyta:] (age 1;8) in which both CR and CL occur, underlining the fact that both processes take place at the same stage in child language acquisition and must therefore be accounted for by one and the same model.

(28) *CL data Steven*

age:	target:			realization:
1;8	*fruithap*	[frœythɑp]	baby food	[fœyta:]
1;9	*bordje*	[bɔrcə]	'little plate'	[bo:tɪ]
1;11	*jij*	[jɛi]	'you'	[jɛ:]
2;0	*geit*	[xɛit]	'goat'	[xɛ:t]
2;1	*herfst*	[hɛrfst]	'autumn'	[hɛ:t]
	er	[ɛr]	'R'	[ɛ:]
2;2	*bal*	[bɑl]	'ball'	[ba:]
3;0	*spijt*	[spɛit]	'regret'	[spɛ:t]
	kwijt	[kʋɛit]	'lost'	[kjɛ:t]
	krijg	[krɛiχ]	'get'	[krɛ:χ]

These data show the example *geit* [xɛ:t] 'goat', where the deletion of the second part of the diphthong is compensated by lengthening the first half. Mapping this datum onto the Top-Down syllable model of Cairns & Feinstein, shown in (15), we see that, in their terminology, the segment in peak position lengthens as the result of the deletion of its satellite. This is perfectly well possible. In this model, long vowels occupy both the peak and the satellite positions within the nucleus. Therefore, CL, in this particular case, could be explained as a structure preserving process. There is an underlying satellite position, the occupyer of which is deleted, and in order to preserve the structure of the present syllable, the segment in peak position is linked to the empty satellite position, with the result that it lengthens.

However, where CL of a vowel occurs after deletion of a segment in coda-position, as is the case in Steven's realisation of *fruithap*, we have a problem. Here, the deleted segment, /p/ occupies the coda position. The lengthening of the preceding vowel should be regarded as the result of the deletion of the coda segment, but in the template of Cairns & Feinstein it is not possible for a vowel to be in coda position, so the long vowel cannot be explained as being linked to the peak node and the coda node. An explanation of CL allowing the vowel to occupy the coda position would have to ignore totally the very important subcategorization restrictions that are an essential part of a top-down model such as Cairns & Feinstein's. Consequently, the model does not account for all the CL-data. The same criticism goes for similar top-down models (e.g. Fudge 1969), which are almost by definition subcategorized for position; how else can the segments be put into their fitting place in the top-down syllable?

It appears that CL is, more than anything else, a weight preserving process. It is therefore used as an important argument for Moraic Phonology by Hayes (1989). He claims to be able to account for all the seven types of CL in his typology (see (26)) and for substantiation of this claim I refer to Hayes' own article. I will not challenge it here.

Because the weight bearing units, the moras, are an essential part of the syllable structure -they *are* the structure-, the explanation of CL in Moraic Phonology can easily be based on weight preservation. Segments and even syllable nodes can be deleted, but not moras; *moras are forever.*

Moras do have to be bound by a syllable-node and must bind at least one segment. Therefore, a mora that no longer binds a segment will find another segment to bind, even if this other segment is already bound by another mora. This will result in the lengthening of that segment. Classical CL according to Hayes' version of Moraic Phonology can be seen in (29). Dutch, the mother tongue of Steven, from whom the data are taken, is a language where Weight by Position applies:

(29) *CL in Moraic Phonology*

The main direction of construction of Hayes' syllable model is bottom-up, but we see that once the structure is present, its main building block, the mora, is preserved and segments can be bound to it top-down. The positions in the 'moraic' syllable are not subcategorized for the type of segments they should contain, simply because the syllabification process works the other way round - the segments trigger the structure.

Unfortunately, though, Hayes (1989) does not mention the type of data in (27), showing CL after satellite loss in closed syllables. This is exactly the type of CL that cannot be accounted for in Moraic Phonology. For example, in *geit* both moras still bind a segment after deletion of /ɪ/. (30a) depicts the alleged representation of *geit* in Hayes' model, (30b) an unwanted adaptation of this model, with the coda segment directly attached to the syllable node, which violates the Strict Layer Hypothesis discussed in 3.1.2 even more.

(30) *Representation of geit in Hayes' Moraic Syllable Theory*

a. Coda segment dependent on μ   b. Coda dependent on σ

Note again that only the undesired (30b) enables us to account for CL as a weight-preserving mechanism. After deletion of the second part of the diphthong in (30a), the coda segment still fills the second mora, so there is no reason for CL to be triggered. Note that exactly this type of CL does not constitute a problem in template models, such as Cairns and Feinsteins, where the satellite position remains present after segment deletion.

In the Autosegmental model proposed by Noske (1992), use is made of CV-slots and the principle of structure preservation to account for CL processes. If a segment is deleted, this results in an empty element on the tier above that segment. This empty element, or slot, will be filled by spreading of a segment adjacent to the one deleted. This seems to work quite well and Hayes' criticism of autosegmental syllable models is clearly put far too strong:

> In fact, when such theories are beefed up sufficiently to handle the full range of CL types, they reduce to something like the claim that any segment can lengthen to compensate for the loss of any other segment (Hayes 1989:254)

This is not true, as, for example, vowels cannot spread to onsets, since onsets are sub-categorized for consonants. Still, the account of CL in the true constituent model has the unfortunate side-effect that we are left with two different representations of long vowels, viz. one in which a long vowel is represented by a branching nucleus (two V-slots) and one in which the vowel occupies a nuclear V-slot and a coda position. The latter representation never occurs directly in syllabification. To say the least, this characteristic gives the model a highly inelegant touch, however important that may be.

As was the case with the account of CL in Moraic Theory, the type of CL in (27) cannot be easily explained in the *true constituent model*. CL after deletion of a segment in nuclear satellite position forms a problem, for when a segment is deleted, its V- or C-slot is deleted along with it in Noske's analysis. A nucleus with a nuclear satellite, such as *geit*, consists of two V-slots. If one segment, and with it one V-slot, is deleted, what remains is a perfectly acceptable syllable structure, with a normal nucleus position, occupied by one V. There is therefore no reason for this V to lengthen as the result of the loss of its satellite. Yet, it does.[25]

Although to a lesser extent, the true constituent model thus suffers from the same problems as more heavily phonotactically constrained top-down models where it concerns CL after coda-loss, while, similar to the bottom-up Moraic model, it is unable to account for CL after loss of a segment in nuclear sattelite position. Instead of meeting both ends,

[25] Perhaps, in the autosegmental account, this type of CL could be explained as being foot-based, where weight is preserved on foot-level, but this would obviously lead to a major inconsistency in the account for different types of CL, as other occurences are accounted for with syllabic structure preservation. The account offered by Schane (1994), to be discussed in §5.2, does not suffer from this inconsistency, as *all* his accounts for CL are foot-based.

the middle way does not meet any, in this case.

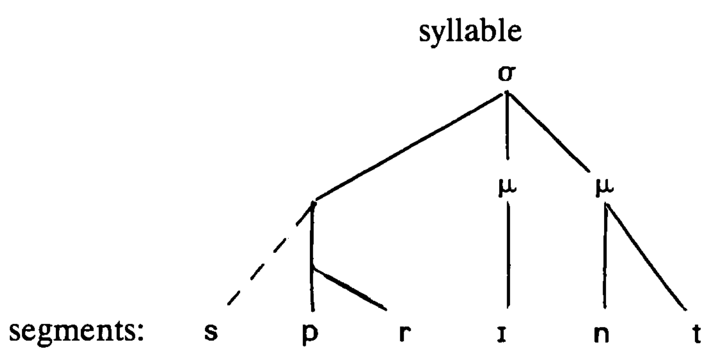
The conclusion is that Moraic Theory provides the best account of *most* types of CL. It seems that a model that incorporates subcategorized segment positions, i.e. a purely top-down model, will always meet serious problems in providing an adequate account of CL. With the exception of the CL data in (27), non-subcategorized bottom-up syllable models seem to be better equipped for this task. For a satisfactory account of CL, therefore, we know now that we have to look in the direction of weight-preservation, as opposed to structure-preservation.

§4.3 Synthesizing Directions

At this point, I would like to go briefly into a seemingly possible solution for the problem noted above, i.e. the observation that a Top-Down syllable model such as in Cairns & Feinstein (1982) is better equipped to give an adequate account of CR-data, due to being heavily structured, while a Bottom-Up model incorporating weight, such as in Hayes (1989) is better equipped to deal with CL-data, due to its lack of structure.

The question is how to reconcile this with the claim of generalizations and brevity of UG. If we will not accept the idea that a child is endowed with more than one syllable construction mechanism, we have to look for a different kind of model. What first comes to mind, then, is a synthesis of both kinds of models. Consider the proposal in (31).

(31) *Synthesis of a moraic syllable model and a syllable template*



The merit of this synthesized syllable model is that it both incorporates the weight representation of moraic theory and the hierarchy of segment positions of templates. In (31), mnemonics, such as 'onset' and 'margin core' fail, but the slanting lines do indicate dependent positions and the vertical lines head positions. Should this be the model Steven uses in his attempts to realize words such as *fruithap*?

With its structured onset and a rhyme that is not phonotactically constrained, the model in (31) enables us to account for CR-data (*fruit* [fœyt]) as well as for most CL-data (*hap* [ha:]). For the exact account, I refer to sections 4.1 and 4.2.

It is not clear how syllabification takes place in (31). Moraic theory syllabifies Bottom-Up, but the question is how syllabification proceeds Bottom-Up with respect to the dependency relations in the consonant grouping left of the first mora. However, one can imagine a process similar to the Syllable Assignment Theory described by Noske

(1992). Syllabification would then proceed as follows:

> **Synthesized Syllabification**
> Certain (language specific) moraic segments within the string of segments will trigger moras, to which the segments that follow the moraic segments are mapped. Moras, in their turn, trigger the imposition of syllable nodes with structured onsets, to which the segments in front of the moraic segments are consequently mapped.

Nevertheless, I want to withdraw this proposal, as it displays the same crucial flaw as Hayes' (1989) model. It still suffers from the same demerit as moraic theory in that it does not obey the Strict Layer Hypothesis (cf. section 3.1.2), even less than Hayes' original proposal. The onset satellite requires an extra level, whereas if there is only one onset segment, this segment skips the level on which moras are represented. Also, this model is still not able to account for CL after nuclear satellite-loss.

§5 CR and CL revisited

Up till now, I have treated the processes of CR and CL from specific viewpoints (if there is a place in science for a term so loaded with subjectivity) on what their probable sources could be. These viewpoints are quite traditional and well-accepted. What we can do, then, is endeavour to find a model that is able to account for the processes as they were presented in §4 - a model that incorporates the 'accepted' sources of the processes. Such a model was proposed in §4.3. Proposed and withdrawn, because the two sources, phonotactic constrainedness and lack of it, were not compatible.

Another option, however, is to take a second look at our premises. Can we be certain that the processes are indeed triggered by what seem to be their most obvious sources? Of course the answer to that question must be "no". Until we have found water-proof solutions (and, indeed, even after that), we have to keep investigating every possibility. Therefore, I will in this section look at other possible triggers for CR and CL than the ones discussed in §4. After this, I will again try to combine the results in search of a model that can incorporate them and thus account for both processes at the same time.

§5.1 CR and Sonority

Prominence relationships in constituent structure, such as used in the syllable-model proposed by Cairns & Feinstein, are certainly effective, but we should not think that they form the only solution to the problem posed by our CR-data. Looking at the sonority of the segments in the onset-clusters in (22) and (23), it is striking that in most cases it is the least sonorous segment that remains when a cluster is reduced. Recall the sonority scale given in (3), here simplified as: obstruents → nasals → liquids → glides → vowels (cf. Lass 1984:264). /b/, an obstruent, is less sonorous than /r/, a liquid, and we find that in *broem*, /b/ will remain when the cluster is reduced. In *stoel*, on the other hand, the obstruent /t/ is the segment that remains; /r/ is more sonorous.

In terms of Child Language Acquisition, it is quite logical for the child to 'choose' to produce the least sonorous consonant in a reduced cluster. The order in which children seem to acquire the phonemes of their mother tongue goes from the biggest constrasts to the smallest. This is reflected in the Principle of Maximal Contrast (Jakobson 1941/68). The first sequence (syllable?) acquired is often that of a consonant with maximal closure (a voiceless labial stop) and a vowel with maximal opening (on the other end of the vocal tract) - /pa/ (cf. Ingram 1989:196). This principle may well be applied to sonority, saying that the easiest sequence for children to produce/perceive is the sequence with the biggest sonority contrast between the segments. Peaks are of maximum sonority, so onsets need to be as little sonorous as possible.

The only remaining problem for the 'sonority hypothesis' is formed by the two attested realizations of *slapen*: [sapə] and [lapə], and by the realization of *slightly*: [lɑɪdiː]. [sapə] is perfectly all right, as /s/ is less sonorous than /l/, but what to do with the others? In §3.4, I have already discussed the special status of /s/, against the background of Harris (1994). Within this framework, the ENA (Empty Nucleus Approach), the coronal fricative can form the coda of a syllable with an empty nucleus. Note that it does not *have* to, if it is the first half of a two-consonant initial cluster, but it *may*. If we assume the syllabification analysis of Harris (1994), then, I would propose that in [sapə], /s/ in underlying /slapən/ is the first consonant of a two-slot onset, while the underlying syllabifications of [lapə] and [lɑɪdiː] are /s.lapə.n/ and /s.lɑɪ.t.liː/, respectively. In the latter two data, it is not a syllable onset that is reduced, but a foot, or word, by deletion not only of a segment, but of a syllable that was already weak because of its empty nuclear licensing position.[26]

As it turns out, sonority provides the required regularity in the process of CR. Therefore, a model that incorporates sonority in structure, or has some other way of making it play a role in processes, has an advantage over others which do not.

[26]Harris' proposal also includes a segment-feature representation based on Dependency Phonology. In this manner, he is able to dispense with the sonority as a phonological feature. His proposal for feature representation, namely, has the advantage that more sonorous phonemes are less complex than less sonorous phonemes. Of course, this is of no concern here, as the outcome according to Jakobson's Principle of Maximum Contrast is the same, whether the contrast is in sonority, or in complexity.

§5.2 CL as a Foot-Based Process

The problems Hayes' moraic account faces with respect to the Strict Layer Hypothesis are due to the fact that moras are directly incorporated in syllable structure. An obvious solution is to extract moras from the syllable and represent them on an autonomous level, cf. the representation of tone in Autosegmental Phonology (Goldsmith 1976). A proposal in this direction by Hock (1986) is elaborated by Schane (1994), who claims that moras are not dependent on syllable nodes, but on feet. In this section we will examine whether our CL-data in (5) can be fully accounted for in Schane's analysis.

Schane's analysis of CL is foot-based. Following Kager (1993), he assumes feet to be bimoraic. The purpose of CL, then, is to preserve the bimoraicity of trochaic feet (μ'μ). (32) shows Schane's account of CL in Latin *kasnus*.

(32) *kasnus* -> *ka:nus*

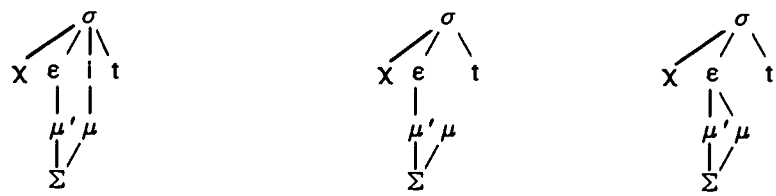
```
underlying form:          delinking:            CL:

  σ     σ                   σ      σ              σ      σ
 /|\   /|\                 /|     /|\            /|     /|\
k a s n u s               k a    n u s          k a    n u s
  | |   | |                 |      | |            |\     | |
  μ'μ   μ'μ                 μ'μ    μ'μ            μ'μ    μ'μ
  |/    |/                  |/     |/             |/     |/
  Σ     Σ                   Σ      Σ              Σ      Σ
```

Note that the representation in (32) obeys the Strict Layer Hypothesis; no levels of representation are skipped by association lines. From the data in (28), *bal* and *fruithap* are of the same CL-type as *kasnus*. A coda consonant is deleted, whereupon the preceding vowel is lengthened.

Now, let us look at *geit*. Recall that exactly this type of CL constitutes a problem for the account of Hayes. A crucial difference between Hayes' account and Schane's account is that in Hayes' account coda consonants are always attached to the last mora of a syllable. In Schane's account, however, a mora binds one segment and if a coda consonant is preceded by a long vowel, this coda segment is *not* associated to the already filled second mora, which binds the vowel. This representation is to be avoided in Hayes' account, because of the Strict Layer Hypothesis, as we have seen in §3.1.2. and §4.2. In (33) we see how the model proposed by Schane is able to account for CL in *geit*.

(33) *geit -> ge:t*

underlying form: delinking: CL:



Deletion of the second part of the diphthong jeopardizes the bimoraicity of the foot. In order to avoid undesired foot structure, the occupier of the head mora widens its scope and fills the dependent mora. This interpretation resembles that in McCarthy and Prince (1993:21), who interpret an empty second mora as sharing the segmental content of the first mora.

Extracting the mora from the syllable thus proves to be the only way to account for CL after coda deletion as well as after nuclear satellite deletion. Schane also shows that his foot-based account of CL can be converted to the recently proposed constraint-based framework of OT. In the next section this will prove to be very convenient, as there are also constraints in OT which enable us to account for CR with the 'use' of sonority, as layed out in §5.1.

§6 CL and CR in Optimality Theory

In the output-orientated OT, representational well-formedness determines the assignment of phonological structure. UG is conceived as a set of unordered conflicting constraints on well-formedness. Every language-specific grammar resolves these conflicts by ranking the constraints in a strict dominance hierarchy. All UG-constraints are active in all languages, but since languages may differ in the dominance sequence of the constraints, not every constraint is equally prominent in every language. In OT all possible output forms of a certain input are in principle available as the ultimate output. All outputs are evaluated and the one that least violates the constraints is the optimal output.

With respect to CL, a number of constraints on foot and syllable structure are in force. All these constraints are claimed to describe universally unmarked characteristics of phonological structure, e.g. the notion that CV-syllables are the least marked syllables (cf. Jakobson 1962) is expressed in the constraints ONS and *COD in (34).

In the representations that will follow below, it has been tried to account for the data with constraints already proposed in earlier work in OT. This new framework faces a slumbering danger in that too many new process-specific constraints, that are introduced almost at random, might seriously undermine the restrictiveness and economy of the theory. It is therefore of great importance that newly introduced constraints are soundly based. In our account of CL in *geit* in (35b), it turns out that we have to introduce a new constraint, which we want to formulate as *DIPHTHONG: avoid diphthongs. This constraint reflects the relative markedness of diphthongs as compared to monophthongs in the languages of the world (cf. Maddieson 1984:133-134). It is comparable to *CODA, which reflects the fact that CVC-syllables are more marked than CV-syllables. For a full substantiation of the other constraints in (34), with the exception of *DIPHTHONG, I refer to Prince and Smolensky (1993) and Schane (1994).

(34) *OT-constraints relevant to CL*

a. foot constraints

BIN-FOOT:	feet are binary
HEAVY TROCHEE:	a foot whose moras are linked to segments of the same syllable is trochaic

b. syllable constraints

(ONS:	syllables must have onsets)
*COD:	syllables must not have a coda
*DIPHTHONG:	avoid diphthongs
PARSE:	underlying elements must be parsed into structure
here PARSE-seg:	underlying segments must be parsed into syllables
FILL:	structural positions must be filled with underlying segments
here FILL-μ:	moras must be associated to segments
*FINAL C-μ:	do not associate a mora to a word-final coda consonant (compare 'weight by position' in the moraic framework)

Note that the so-called faithfulness constraints PARSE and FILL in (34) declare that, ideally, input segments are in a one-to-one correspondence with syllable positions. This corresponds to the notion of optimal licensing in former frameworks. Note that PARSE is undoubtedly defined as a bottom-up mechanism of syllable structure assignment, whereas the definition of FILL clearly indicates a syllabification direction that is top-down. Thus, the choice between top-down and bottom-up syllabification is circumvented in OT.

Now, let us examine how the CL-data of Steven can be accounted for in OT with these constraints. (35) shows tableaux of *bal* and *geit*. '< >' indicates unparsed element, 'vac' means vacuous application, and 'μ μ' unfooted moras.

(35) *OT-account of CL*

a. *bal -> ba:*

constraints / candidates	BIN FEET	HEAVY TROCH	FILL MORA	*CODA	PARSE SEG	*FINAL C-MORA
b a l (μ'μ)				*!		*
b a l μ μ	*!	vac		*		*
☞ b a<l> (μ'μ)					*	
b a<l> (μ'<μ>)			*!		*	
b a l (μ μ')		*!		*		*

b. *geit -> ge:t*

constraints / candidates	BIN FEET	HEAVY TROCH	FILL MORA	*CODA	*DIPH-THONG	PARSE SEG	*FINAL C-MORA
g e i t (μ' μ)				*!	*		
g e i t μ μ	*	vac		*!	*		
☞ g e <i> t (μ' μ)				*		*	
g e <i> t (μ'<μ>)			*	* !		*	
g e <i> t (μ' μ)				*		*	*!
g e i t (μ μ')		*		*!	*		

In (35a) the third candidate, [ba:], satisfies the constraint ranking best. No ranking of the first four constraints can be given at this point. Eventually, Steven, whose respective productions of *bal* and *geit* are used here, will have to learn that, in Dutch, PARSE-seg must dominate *CODA and *DIPHTHONG in the ultimate hierarchy of his mother tongue. Bear in mind that what is proposed here is not the constraint ranking of Standard Dutch, but the confused ranking of a two-year old child suffering to get its OT-constraints in proper order.

The optimal candidate in (35b) is [χɛ:t]. Here, /ɛ/ widens its scope to the second mora, whereas in its first rival, [χɛt], the coda /t/ fills the second mora. The latter candidate, however, violates the *FINAL C-μ constraint, which is the only difference between these two candidates. The standard Dutch optimal output [χɛit] is not chosen, because Steven has a far too high ranking of *DIPHTHONG. We may conclude that the CL-data in (28) and (27) are well accounted for in OT.

With respect to CR, OT chooses the least sonorous segment in a string as the optimal candidate to occupy the onset position. CR may be accounted for along the same lines as the suggestion in OT for the analysis of deletion languages (Prince and Smolensky 1993:172). Within complex onsets the least sonorous segment occupies what may be called the head position, i.e. the margin core. Thus, in *broem*, /b/ will fill the margin core position, whereas in *stoel* /t/ will, since /b/ and /t/ are less sonorous than /r/ and /s/, respectively. Given the discussion in §5.1, it should come as no surprise that a child that is only capable of realizing one onset segment, will 'choose' the least sonorous segment in order to create the optimal onset. The OT-tableau of the account for CR proposed here is shown in (37). Note that use is made only of the constraints that are most relevant to this particular account. Constraints that have not yet been introduced in this thesis are *COMPLEX ONSET and ONSET HARMONY (H-ONS):

(36)	*COMPLEX ONSET:	onsets should not contain more than one segment
	H-ONS	onsets should be as least sonorous as possible

And this is how it works:

(37) *OT-account of CR in /brum/ -> /bum/*

constraints / candidates	ONS	*COMPLEX ONSET	H-ONS	PARSE SEGMENT
b r oe m		*!		
☞ b<r>oe m			/b/	*
<b>r oe m			/r/!	*
<b><r>oe m	*!			* *

The constraint ranking in (36) is best satisfied by candidate number two. H-ONS sees to it that /b/ is better suited than /r/ to serve as the simple onset. Both candidates violate PARSE SEGMENT, but that is of no matter, because *COMPLEX SEGMENT is ranked higher than PARSE SEGMENT in the constraint hierarchy.

Choosing the least sonorous segment should be seen as a well-formedness condition. This is the reason why it is less obvious to apply the sonority-solution to CR in the moraic models of Hayes (1989) and Schane (1994), as may seem possible. The moraic model is not output-orientated, but based on input. Conditions on well-formedness are less appropriate in an input-orientated model than in an output-orientated model, such as OT.

In order to avoid the remaining problem for the present OT formed by the two attested realizations of *slapen*: [sapə] and [lapə], I believe we have to look in the direction of Harris' (1994), as explained in §5.1. For instance, /s/ cannot be regarded as extrametrical, since extrametricality is disgarded in OT. The special status and position of /s/ in phonological structure is nevertheless sufficient reason not to regard this problem as a fundamental flaw in the OT-analysis. Possible directions towards a solution (e.g. different syllabification where /s/ belongs to another syllable (cf. Harris 1994)) will be discussed in Part II of this thesis, when I deal with the reduction of onsets in the formation of Sranan.

§7 Conclusion to Part I

In part I, I have tried to find a solution for the 'direction problem' in syllable theory. In the analyses of some participants in the discussion, segments are syllabified Bottom-Up, whereas others make use of syllable templates and regard syllabification as being directed Top-Down. Still others have found ways of circumventing, or even ignoring the problem. In order to make a sound comparison of the different analyses, I have looked closely at two different processes. The first of these, Cluster Reduction, seemed traditionally to be triggered by typical characteristics of Top-Down syllables, while the second, Compensatory Lengthening, was more satisfactorily accounted for in Bottom-Up analyses (including weight in the structure). As always, the solution seemed to lie in compromise.

After comparing the genuinely Top-Down and Bottom-Up analyses with respect to the processes mentioned above, and showing that the 'middle-way' analyses discussed in the first part of this thesis were not able to deal with both processes at the same time either, I took a second look at the processes and discussed alternative ways to account for them. CR turned out to be possibly accounted for as triggered by sonority. A proposal to incorporate phonological weight in foot structure, as opposed to in syllable structure, provided an opportunity to account for more, or even all cases of CL.

In the last section, we saw that these alternative ways to account for CR and CL could be incorporated in the fairly recently proposed but (or: and therefore?) widely popular Optimality Theory. The claim of Part I of this thesis, therefore, can only be that OT provides the best solution to the problem of direction of syllabification. And so it is.

Part II

§8 Language Acquisition and Creolization

On the following pages, I will discuss some of the findings of the previous part of this thesis in relation to creolization. Creolization is the genesis of 'new' languages out of extended contact between two (or more) language communities. A creole language constitutes the mother tongue of language community, as opposed to a pidgin, which only serves communicative needs between different language communities.

In part I, we found two specific types of processes taking place in First Language Acquisition. It seemed that these processes, Cluster Reduction (CR) and Compensatory Lengthening (CL), were difficult or even impossible to account for with one syllable model. After having compared a number of syllable models and syllabification analyses, our conclusion was that Optimality Theory (OT) (Prince & Smolensky 1993) provided a model capable of accounting for both our data of CR and CL. Specific tableaux, showing how the processes of CR and CL where possible to occur in Child Language, were proposed in §6.

It seems that processes such as those described above also occur in creolization. To name two examples, the realization of *boil* /bɔɪl/ in the 'Black English Vernacular' (BEV) is [bɔ:l], while that of *through* /θru(w)/ may be [θu(w)] (cf. Labov 1972). BEV is considered a type of creole, by, for instance, Labov (1972). Examples such as these have triggered the comparison, presented below, between First Language Acquisition and Creolization.

§8.1 Issues in Language Acquisition

In modern linguistics, when we deal with First Language Acquisition, the idea of Chomskyan UG, or the most unmarked and simplest 'starting grammar' is always in the back of our heads. If it exists, to define this grammar should be one of the major goals of the study of language and linguistics.

This provides the linguist with an attainable Utopia. It is therefore that the study of linguistics received such a boost in the mid-fifties with the 'Chomskyan revolution'.

The idea is that all children are born with the same (empty) grammatical structure. This structure consists of principles and parameters, i.e. some structural characteristics which cannot be changed, and some characteristics which complement one another. The grammatical parameters are set by the input the child receives. This input is the language spoken to and around the child - its mother tongue/native tongue.

The hypothesis that a child has the advantage of an already present structure or system applicable to language is to account for the relative ease with which children seem to learn (their) language. At the same time, it accounts for the fact that languages all over the world show similar structures and behaviour.

Let us briefly focus our attention on the parameters of this 'Universal Grammar'. Children do not learn most of their language through instruction. They do not receive negative input, i.e. they do not hear the structures they are *not* supposed to use and they are not told that such and such structures are 'wrong'. This only starts at a later age, for example in school, when idiolects are polished. In the first stages of language acquisition, however, children teach themselves (unconsciously, of course) from the positive input they receive. Yet, children do not wait with using their language until they can do so perfectly. On the contrary, they try, they practise and they tend to use their own linguistic structures. The theory, then, is that children can do al this because their universal parameters have *marked* and *unmarked* settings. A child acquiring language will tend to use the unmarked setting of a parameter, until it has recognized the marked structure in the input-language it is acquiring, i.e. if this marked structure is part of that language. Only then will it set its parameter to the marked setting. It should be noted here that certain parameter settings also affect others, so a specific setting can trigger off other parameter settings.

The line of reasoning summarized above resulted in great interest in First Language Acquisition. If it is correct, children should provide a clear window through which we can look at Universal Grammar, that mythical hidden structure and framework we all universally share, in its most unmarked form.

In terms of OT, which played an important role in part I of this thesis, the principles of UG are stored in GEN, a collection of universally inviolable constraints, while the parameter-values of UG are a consequence of ranking of the other constraints. The "basic idea", in the words of Prince & Smolensky (1993: 128), is "*parametrization by* *ranking*". The constraints are already present and need only be set in the correct (mother tongue) order. Some orderings, however, are more marked than others, so children will start off with the order which is least marked. Ideally.

Of course, nothing is ideal. Linguists in the field of First Language Acquisition are still fiercely debating the questions whether or not or to what extent we can assign structure to child language, whether or not children behave similarly in similar linguistic circumstances and towards similar structures, and whether the linguistic input (stimulus) children receive is really so poor that we need the UG-theory to account for the learnability of language.

Even within the framework of OT there is disagreement at present about whether the constraints are initially ordered or unordered when a child starts to acquire its language, let us say when it is born. The point was raised on the "Optimality List", a computer network, by Nakamura (Optimal., 17 April 1995). Most interpreters of OT, however, work under the assumption that the initial ranking of constraints is random, or rather, that there is no initial ranking, as pointed out by the reactions of Turkel (Optimal., 18 April 1995) and Prince (Optimal., 19 April 1995) to Nakamura's query.

My opinion in this matter is different. If there is no initial (default) ranking, there is no reason for children to make similar mistakes across the globe; their mistakes should be random as well. Yet they are not, as we have seen in part I, so there must indeed be some sort of initial ordering, untainted by the mother tongue, to account for the similar 'mistakes' children make, such as those discussed in part I of this thesis, and for the similar stages they go through during the process of acquistion of their mother tongue.

In a forthcoming paper, Gilbers and Van der Linde (forthcoming) show paradoxical results with regard to initial rankings of constraints in an OT-framework. It turns out that children, in their acquisition of the phonemes and phoneme-sequences of their mother tongue, do follow a pattern and order of acquisition which could be described as motivated by an initial (default) ranking, slowly re-ordering towards the ranking of the mother tongue. This process would occur in stages. However, the data of Gilbers and Van der Linde (forthcoming) also include those of a child which seems to use all the different stages in ranking during the course of one day! This might be regarded as counterevidence to a default ranking, but if we accept this, we are still left with the question why, on the whole, children *do* follow the consistent re-ordering pattern in the acquisition of their mother tongue.

To me, this state of affairs seems to point towards the idea of constraint rankings as 'loaded dice'. In this hypothesis, initial ranking is not random, or simply not there. It is only less strict, and with an *inclination* towards a certain default ranking. Thus appears a middle-way between ranking and non-ranking: children playing poker with constraints (and cheating as well). I believe that this hypothesis is worth exploring. To do this now, however, would take us too far from the present subject, which I am still only introducing.

Comparable questions to those mentioned above are being discussed in the field of creolistics. The main issue here is between two sides, although the majority of linguists seem to have settled on a compromise, using both.[27] Below, I will put two stands that are fundamentally different opposite one another, after which I will discuss a compromise.

§8.2 Creolization

In the field of creolistics, the main standpoints can be classed in either of two hypotheses: the Substrate Hypothesis and the Universalist Hypothesis. For a concise history of the development of these theories, I refer to Gilbert (1986).

According to the Substrate Hypothesis, a pidgin or creole develops out of two or more languages because of communicative needs. The syntactical and phonological structures of the substrate language(s) are combined with the lexicon of the superstrate language(s). The pidgin turns into a creole if it becomes the (or a) mother tongue of a new generation of speakers, but this creole will *not* differ much from the pidgin, except perhaps in being more uniform and less chaotically structured.

Linguists adhering to the Substrate hypothesis have the endless task of showing that all grammatical features, i.e. all syntactical, phonological, semantical characteristics, can be traced back to the languages out of which the creole developed. They also have to prove that, where creoles are very much alike, this is because they developed out of

[27]Eersel, p.c.

the same or similar languages.

The Substrate Hypothesis is often (unfairly) associated with the Monogenetic Hypothesis. The latter says that creoles are very much alike, because they derive from some sort of 'Primitive Pidgin', a lingua franca spread by seamen and traders and intended for communication with the different peoples they came into contact with. This explanation seems highly unlikely and, as Mufwene (1986) points out, it still does not provide an answer to the question of how this language originated. Furthermore, there is no reason why there would only be *one* such language. If one 'primitive' pidgin could have come into being, why did this not happen a second, and a third time, elsewhere? Consequently, the Monogenetic Hypothesis is no longer regarded to present a serious alternative.

The opposite side, of which Bickerton can be seen as the most successful proponent, claims that language universals play a large part in creolization. According to the Language Bioprogram Hypothesis (LBH) (Bickerton 1984), the pidgin develops, again out of communicative needs, according to the principles of Second Language Acquisition. Up to this point, there is no significant difference with the Substrate Hypothesis. The resulting pidgin is imperfect and unstable. It will, however, be the only language in the community where it is spoken that serves the communicative needs. Therefore, it will be the, or a mother tongue of the children born in that community. The input the children receive will thus be imperfect and the children will (unconsciously) complete the language with the use of their innate knowledge of Universal Grammar, setting parameters in the form that is most natural to them, their unmarked setting.

It follows that the task of the 'universalist' is to show that creoles have characteristics which are not found in any of the substrate or superstrate languages. A universalist will also always point out that creoles all over the world, with different backgrounds, are very much alike (as will the monogeneticist). Universalists are in trouble when a creole shows a highly marked structure, also occurring in a substrate language.

The Universalist Hypothesis has recently been criticized for implying that creolization equals nativization and that nativization is a instantaneous process. Evidence suggests that some creoles have developed rather slowly, over a long period of time, and subject to various different influences. This has led to the so-called Gradualist Model of creolization (e.g. Arends 1993). However, it seems quite plausible that, in a framework where universals have marked and unmarked parameter settings, or where constraints may be violated, language specific settings or rankings may sometimes take a little time to crystallize. We have seen evidence of this in First Language Acquisition data in part I of this thesis.[28] Children do not immediately stick to the 'correct' ranking of constraints, or setting of parameters. We can also imagine, then, that rankings or settings may even change as a result from new and different (external) influences. The Gradualist Model and the Universalist Hypothesis, therefore, do not necessarily have to clash.

'Extremists' on both sides (i.e. substratist and universalist) have provided one another with evidence and counterevidence for almost two decades, without really being able to convince the opposite side. This is not surprising, as both sides indeed present evidence against the other's case which cannot be ignored.

Bickerton (1977) describes his paper Bickerton (1974) as

> [...] a paper that (a) showed striking similarities between the Hawaiian Creole and some Caribbean Creole tense-aspect systems, which could not be derived from any of the various languages in contact, and (b) indicated that these similarities could not have come about through diffusion of a pre-existing contact language, since it was precisely the features Hawaiian Creole had in common with other early-creolized creoles that were rarely or never found among surviving speakers of Hawaiian Pidgin. (Bickerton 1977, p. 63)

For an argument in favour of the Substrate Hypothesis, I quote Mufwene (1986):

> The non-singular Oceanic pidgins and creoles, but not their Atlantic counterparts, generally have a dual/plural distinction as well as an inclusive/exclusive distinction in the first person [...]. Based on geographical-statistical considerations alone it can certainly be claimed safely that a system with an inclusive/exclusive distinction is more complex and more marked than that without this distinction. The distinction is generally absent from African languages and from the European languages which have lexified most creoles known in the literature. It is, however, common among native Oceanic languages [...]. The same is also true of the dual/plural distinction. (Mufwene 1986, p. 141)

The logical conclusion, of course, is that the truth lies somewhere in the middle, and this is indeed the general consensus today. It is easily explainable, as well. A Language Learning Hypothesis along the lines of Chomsky requires two things: Universal Grammar and input to fill it. If the input is strong and structured and recognizable, it will be 'incorporated' in the already existing structure of UG, where it will set parameters

[28]This problem is also adressed by Gilbers & Van der Linde (forthcoming), as pointed out in the previous paragraph, where the 'loaded dice hypothesis' was briefly discussed.

in the marked setting, if necessary, and provide an adequate structure for communication and further acquisition. The input will have to be strong, because setting parameters to their marked setting takes some 'persuasion'; they had rather stay in their unmarked setting. This part would correspond with the Substrate Hypothesis of creole genesis. On the other hand, if the input is chaotic, or, more importantly, incoherent and incomplete, it will not 'fit' into the structure of UG. Parameters will remain in their unmarked setting and the resulting language will appear simpler than others. This part corresponds to the Universalist Hypothesis.[29]

These two different possibilities can go together quite well. Parts of the input (which, in creolization, will be the pidgin) may be less chaotic than others. These parts will result in a well-structured part of the creole, though perhaps a marked structure. The chaotic structures in the input will be most likely to result in unmarked structures for that specific part of the language. In the examples quoted above, the particular tense-aspect system of Hawaiïan Creole was clearly not present in the input, while it did serve a communicative purpose. It therefore popped up from the speakers' unconscious knowledge of UG. In the second example, however, the dual/plural distinction and the inclusive/exclusive distinction were well and structurally established in the input (probably a pidgin with at least one native Oceanic language as its substrate), resulting in incorporation of the highly marked structure in the creole. If the structure is there and it fits, then why not use it?

Of course, the marked and the unmarked parts of the creole should not clash. Some parameters and their settings, namely, force other specific settings.

If the simplified outline sketched above is not too remote from the truth, the relation between Creolistics and First and Second Language Acquisition is quite strong. With this in mind I will look again at some conclusions of part I of this thesis, concerning First Language Acquisition and syllable structure, and discuss their possible implications for syllable structure in creole languages. As for creole languages, I have chosen to look specifically at Sranan, spoken in Surinam.

[29]In this thesis, the so-called Universalist Hypothesis refers to the Language Bioprogram Hypothesis (LBH) (Bickerton 1984) as well as similar proposals. Simply referring to this set of proposals as the LBH would focus the attention too much on one particular interpretation of the universalist idea, namely Bickerton's.

§9 Creole Genesis and Syllable Structure: Sranan

§9.1 History of Sranan

For the following brief history of Sranan, I rely heavily on the descriptions in Smith (1987) and Arends, Muysken & Smith (1995).

Sranan is the official language of the 'Republic of Surinam'. Today, it has about 500,000 speakers, one-third of whom are resident in the Netherlands. It is the first language for approximately 300,000 of its speakers.

The origin of Sranan lies in the slave-trade of the seventeenth century, when Surinam was an English colony from 1651 until 1667. After the English came the Dutch, but it is remarkable to see how little influence Dutch seems to have had on Sranan compared to English, while the Dutch political influence lasted for more than 300 years.

The citation below exemplifies the view of creolization of Smith (1987), where the main emphasis with regard to the genesis of Sranan lies on substrate, adstrate and superstrate influence:

> We see Sranan then as having two main strands: an English-based pidgin/creole deriving directly from Barbados and the other colonizing islands, and indirectly from the Lower Guinea area of West Africa, centred on the Slave Coast [(this strand is also referred to as West African Pidgin English (WAPE) - DBdO)], and secondly the standard English spoken by the whites of Surinam, also deriving directly from Barbados, and the other islands. Other strands are formed by the [...] three African languages [Gbe (Ewe-Fon), spoken on the aptly named Slave Coast, Kikongo, spoken in the west of the Congo, as well as in Northern Angola, and to a lesser extent Twi, spoken on the Gold Coast.] [Their] input has mainly been of a lexical and phonological nature. (Smith 1987, p. 9)

Anticipating the discussion below, this last remark refers to the fact that neither Gbe nor Kikongo "admit final consonants" (Smith 1987, p. 10), which, as we will see, is also true of Sranan, if 'consonants' is taken to mean only 'obstruents' (fricatives and plosives) on the sonority scale.

Since in part I the processes of Cluster Reduction and Compensatory Lengthening in First Language Acquisition were dealt with separately, I will also divide the description of syllable structure in Sranan into discussions of the onset and the rhyme, respectively. After these separate discussions, I will endeavour to join the results together.

§9.2 Onsets in Sranan

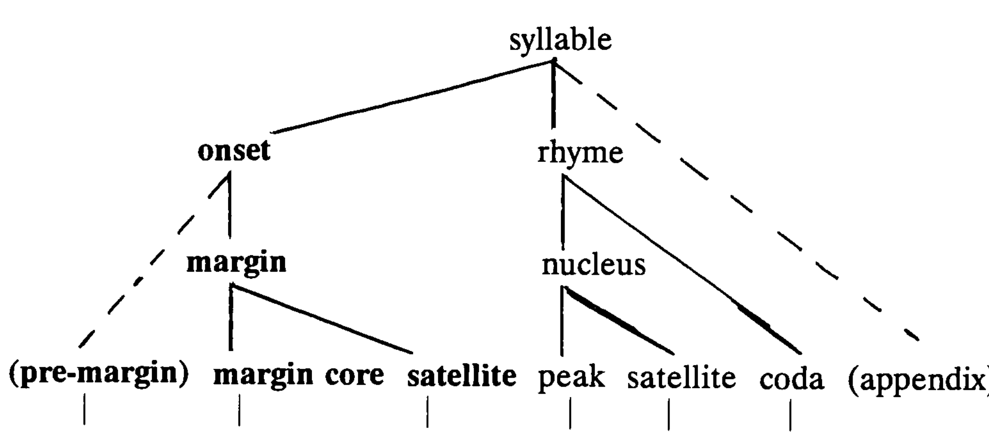
Consider the following data from Sranan:

(38)	ede	-	head
	peni	-	paint
	stari	-	star
	sweri	-	swear
	kweri	-	square

In this sample of possible Sranan onsets all the possible positions in a Sranan onset(-cluster) are represented. The onset may either be empty, filled with one C, or with two C's. There seem to be only two exceptions to this generalization, viz. /stjupaŋ/ (stewpan) and /skwala/ (squall), but these "appear to be recent loans from English, being only evidenced in modern Sranan" (Smith 1987, p. 230). Indeed, if we agree with Van de Weijer (1994) that /kw/ and /tj/, in such cases, are probably complex segments, or with Fudge (1969) that /st/ is a complex segment, as opposed to two segments, these forms are not even exceptions. I will return to them below.

In the representation of the syllable adapted from Cairns & Feinstein (1982) (cf. part I, §3.2.2), which is very convenient for the showing of positions, there are two possibilities with respect to the onset structure of Sranan. Cairns & Feinstein's (1982) model is repeated here in (39).

(39) *Syllable model after Cairns & Feinstein (1982)*



The first possibility is that Sranan does not allow, or has no place for onsets with pre-margins, but knows only the margin core and its satellite. If so, this satellite should not be subcategorized strictly for sonorants, as this would clash with the well-formedness of Sranan words such as /stari/, where /t/ would have to occupy the margin satellite position. This cannot be, however, because it would undermine precisely the most important characteristic of margin satellite positions in a model such as this.

The second possibility in this model is that Sranan onsets do in principle include the pre-margin node. This scenario requires the addition of a constraint, rule or representational characteristic with the tangible result that no more than two nodes may be filled, one of which must be the margin core. We are, again, heading in the direction of OT.

Let us now compare a number of Sranan words showing complex onset syllables with their English counterparts. English is by far the most important superstrate and lexical provider of Sranan. Data are taken from Smith (1987).

(40) *English vs. Sranan onsets*

I English (C)	**Sranan**	**II English (CC)**	**Sranan**
bite	[beti]	blind	[breni]
ripe	[lepi]	play	[prej]
fight	[fetɪ]	greedy	[gridi]
set	[seti]	throw away	[trowe]
wind	[weni]	thrust	[trusu]
paint	[peni]	proud	[prodo]
III (sCC)		**IV (sC)**	
square	[kweri]	skin	[skiŋ]
scrape	[krebi]	spoon	[spuŋ]
scratch	[krasi]	spoil	[pori]
squeeze	[kwɪnsi]	stink	[tiŋi]
strong	[traŋɑ]	speak	[piki]
string	[triŋi]	spit	[spiti]
		stop	[tapu]
		star	[stari]
		stick	[tiki]

As we can see, English simple (one C) and CC-onsets (categories I and II) prove to be no problem for Sranan. The interchange of the liquids /r/ and /l/, as in '*ripe* → [lepi]' and '*play* → [prej]' is quite common. In fact, distinguishing them as separate phonemes seems to be a marked option for a language (comp. Mandarin Chinese and Japanese, where no distinction is made between the two sounds), so the confusion obvious from the data is not strange.

Also clear from the data above is the fact that sCC-onset clusters (category III) are diminished by deletion of initial /s/.

The case is less clear where English sC-onset clusters (category IV) are concerned. When the Sranan onset is simpler than the English onset, it is always /s/ that is missing in Sranan. However, some sC-clusters are the same in English and in Sranan. There seems to be no obvious relation between the type of sC-onset in English and the presence or absence of /s/ in Sranan.

Above, the term Cluster Reduction is deliberately avoided. This is for the reason that we have not yet ascertained that we are actually dealing with a case of CR. We must also remember that at least one strand of input for Sranan as a creole was a pre-creolized pidgin, identified as West African Pidgin English (WAPE) (Smith 1987). For the time being, however, and for the sake of argument, I want to look at English as the *input* of a certain process and at Sranan as the *output*.

If we regard the relation between English and Sranan as such, there may also be, or have been another strategy adopted by Sranan to break up English onset-clusters. This is the strategy of epenthesis. Consider the following data from Smith (1987).

(41) *Epenthesis*

English	Sranan
smell	[sʊmɛ:]
smoke	[sʊmʊkʊ]

So far, I have only found evidence of epenthesis in /sm/-onset clusters, which may be generalized as /sN/-onset clusters. Also, the data in (41) are copied from Smith (1987), while they contradict my own observation that there is no epenthetic vowel between /s/ and /m/ in these words at all. A Sranan speaker interviewed by me actually claimed that the epenthetic vowel did only exist in written Sranan. Nevertheless, Smith (1987: 230) suggests that

> the /s/-dropping strategy might have been that originally adopted by WAPE [...], while the epenthetic vowel strategy might have been utilized in Surinam [...]. This is clearly not the whole answer, as a very few Dutch items seem to show /s/-dropping, cf. Sranan /tíbri/ 'stuiver' [five-cent piece, DBdO] [...]. The effects of the epenthesis strategy have been nullified in modern Sranan, of course, by syncope.

This is indeed a very interesting suggestion. If it is true, this means that words which include syllables with category IV onsets still having initial /s/, where adopted by Sranan at a later stage than category IV words in which /s/ was deleted.

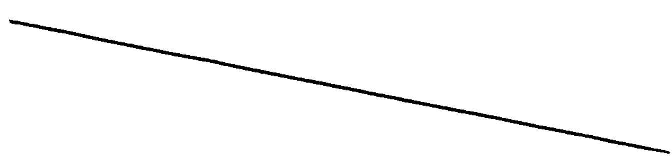
The data above, regarded in this light, point towards a stage in the genesis of Sranan where the pre-margin position was absent from the onset, or was not 'allowed' to be filled. To deal with the English input, /s/ was deleted altogether at first. Yet, later on in the development (i.e. in Surinam, if we go by Smith 1987), the strategy of epenthesis was preferred. What we can imagine, then, is that, perhaps because of the diminishing African influence on Sranan and the extensive amount of English and Dutch influence, or because of a normal process of 'complexification' during language development, Sranan did change to allow the pre-margin position, or to allow it to be filled. This gave way to vowel syncope of most of the epenthetic vowels which first broke up initial /sC/-clusters.

This analysis is able to account for all the data in (40). Two questions remain, however. The data in (41), showing epenthesis in a /sN/-onset cluster, remain strange, as precisely this type of onset would be perfectly well-formed with /s/ in margin core position and /N/ in margin satellite position. There would thus be no reason for epenthesis, while it is exactly this type where evidence of epenthesis is still present, even if only in written Sranan. Also, if Smith's careful proposition quoted above is fully true, this means that there was a stage in Sranan, where not only the pre-margin did not exist, but where complex onsets were not possible at all. Epenthetic vowels which broke up the clusters were lost by syncope when complex onsets became possible and well-formed in later Sranan. I must express that I do have a problem with this analysis, claiming a stage in Sranan when only simple onsets were possible, as it seems to me that there should have remained more evidence of this stage. Note that the only possible evidence presented (and found) here are the data in (41), showing surviving epenthetic vowels.

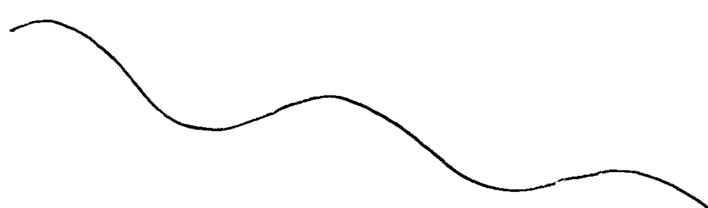
The approach above brings us on the subject of language development, the life of language. A very popular belief is that languages, during their course of development, become less and less marked - simpler and simpler. Indeed, it often seems to be that way. However, what is avoided, then, is the obvious question why languages became marked, or complex in the first place. And this is a question we do have to deal with. Sranan, as described above, appears to be a language which became (phonologically) more marked, as opposed to less marked, during its course of development. What I would like to suggest is that language development does not necessarily take place from a marked state to an unmarked state, as shown in figure (42a) below. On the contrary, it may, due to growing communicative needs which demand a greater variety within the language, move from a certain state into a more marked state. Languages may also change and become more marked as a result of external influences, such as other (contact) languages, and even as a result of simplifying processes taking place in a different domain within the same language.[30] This process would continue until the language in question reaches a certain point where it is so marked that communication is hindered and the language is thus unnecessarily complex. At this point, the language would drop back to a more unmarked state, for the sake of simplicity, again with the same communicative motivations. This undulatory hypothesis of language development is pictured in figure (42b).

(42) *Language development*

a.



b.



[30]J. Hoeksema (p.c.), see also Appel, Hubers & Meijer (1979: 201-23). For example, a phonological process that obliterates the phonological distinction between two phonemes (thus becoming allophones), may well have the effect that certain words, which were only distinguishable because of those phonemes, now become homonyms. Homophony is a marked aspect of the domain of semantics.

As for external influences of other languages, it must be said, of course, that this influence, if it leads to complexification and more marked structures, will have to be very strong indeed. As noted above, it takes some 'persuasion' to change a parameter to its marked setting.

§9.3 Sranan onsets and Optimality Theory

Now, in accordance with the conclusions of part I, I will attempt to give a possible representation of the development of Sranan onset structure as proposed above, in the framework of OT. I will show that more constraints, or indeed a different analysis of syllable structure from that proposed in part I, are necessary in order to give a satisfactory account of the data presented above. If there was indeed a stage in which Sranan only allowed simple onsets, a high ranking of the constraint *COMPLEX ONSET (cf. part I, p. 58) probably was the cause of this state of things. Whether there was such a stage, however, is far too unclear, as I pointed out in §9.2. I will therefore concentrate on initial /s/-deletion and focus on possible causes for this process. For the explanation of constraints that are not newly introduced in this section, I refer to Part I (§6, p. 55-8) and to Prince & Smolensky (1993).

§9.3.1 *PRE-MARGIN

As we have seen in the data above, it looks as though Sranan started out without a pre-margin onset position. The type of 'CR' we observed when comparing the English input and the Sranan output cannot be accounted for with the use of the constraint *COMPLEX ONSET, as complex onsets without a filled pre-margin position appear to be perfectly well-formed in later Sranan (cf. category II in (40)). We somehow need to be able to express that /sC(C)/-onsets are more marked than other /CC/-onsets, or even that they are impossible.

In order to do this, it seems that we need a constraint which is specific for that particular onset-position, for example the following syllable constraint:

(43) *PRE-MARGIN: syllables must not have a pre-margin

This constraint would work as shown in (44), where English forms are regarded as the input, and the correct Sranan forms appear as the output.

(44) a. **PRE-MARGIN resulting in CR in spoil → [pori]*

constraints / candidates	ONS	*PRE-M	H-ONS	PARSE SEGMENT
s p 6ri		*!		
s <p> 6ri			/s/!	*
☞ <s> p 6ri			/p/	*
<s><p> 6ri	*!			* *

b. **PRE-MARGIN resulting in CR in square (/skweə(r)/) → [kweri]*

constraints / candidates	ONS	*PRE-M	H-ONS	PARSE SEGMENT
s k w eri		*!		
s <k> w eri		(*!)	/s/!	*
☞ <s> k w eri			/k/	*
s k <w> eri		*!		*
s <k><w> eri			/s/!	* *
<s> k <w> eri			/k/	* *!
<s><k> w eri			/w/!	* *
<s><k><w> eri	*!			* * *

In (44a) candidate [pori] wins, although it violates PARSE, which, therefore, has to be ranked relatively low in the hierarchy. Note that [sorɪ] does not violate *PRE-MARGIN, but that is loses because /p/ satisfies H-ONS better than /s/.

In (44b) candidate [kweri] is the winner over runner-up [keri], because the latter violates PARSE twice; once more than [kweri].

Candidate [sweri] deserves special attention. Depending on how the segments /s/ and /w/ are parsed, it does not necessarily violate *PRE-MARGIN. However, if it does not, /s/ still loses out on /k/ as an onset, because /k/ is less sonorous and therefore a better candidate according to the constraint H-ONS.

Let us assume that the constraint *PRE-MARGIN was ranked as in (44) in the initial stages of the development of Sranan. We know that, in later stages of Sranan development, onsets such as in /stjupaŋ/ and /skwala/ pose no problem. The OT-account for this fact, then, will be that *PRE-MARGIN has lowered in the constraint hierarchy and has thus become less of an influence. This may be for various reasons, for which I refer to the discussion in §9.2 above.

Although *PRE-MARGIN seems to work, however fragilely, it does pose a problem. To assume the constraint would imply the introduction to OT of specific positions on a level even lower than 'onset' and 'peak', which are already used in constraints. We know from OT, however, that in this framework we want to "idealize away" (Prince & Smolensky 1993: 127) as much as possible "all dimensions other than sonority" (ibid.). Although I have a strong feeling that the actual structural position of /s/ plays a definite part in the process described above, I choose first to proceed more along the lines of OT as it exists. Therefore, we will again turn to sonority values for the solution to our problem, which is to give a description of possible onsets in early and later Sranan.

§9.3.2 Sonority once more

In this paragraph, I re-introduce sonority and 'harmony' as the main driving forces behind CR. Recall that this was the line of approach opted for in part I, when we were dealing with First Language Acquisition data. What we used there, was a constraint, H-ONS or 'onset harmony', stating that onsets should be as least sonorous as possible. It is known that the ideal, or unmarked sonority slope for a syllable goes from non-sonorous in the onset to maximally sonorous in the peak and back to non-sonorous in the coda (Part I: 11). Pre-marginal /s/, when present, forms a marked exception to this generalization (cf. Part I, footnote 5 and §3.4). What we can imagine, then, is either of the two following OT-constraints:

(45)	H-SLOPE	the level of sonority within a syllable rises towards the peak, where it is maximal
	H-COMP ONS	the level of sonority within complex onsets rises

At this point, i.e. when we are dealing solely with CR in onsets, it does not make any difference whether we should use H-SLOPE or H-COMP ONS; they both have the same output effect. H-SLOPE is, logically, more generalizing than its onset-counterpart, which works for a smaller domain. The constraint hierarchy incorporating one of these constraints looks exactly the same as the tableau in (44), the sole difference being that H-SLOPE or H-COMP ONS replaces *PRE-MARGIN.

Although this analysis also does the job, just as the analysis with *PRE-MARGIN did, it is not devoid of problems either. The drift of Prince & Smolensky's (1993) discussion of Harmony in syllable constraints is that the sonority slope is a *result* of the various harmony constraints, H-NUC, H-ONS and H-CODA. To introduce a new constraint of which the realization of the sonority slope is a deliberate *objective*, would seem somewhat redundant in this perspective. Note that this counts for H-SLOPE as well as for H-COMP ONS. The latter would have to be a sub-constraint of a group including H-COMP NUC and H-COMP CODA. An OT-analysis in which a large number of constraints all deal with a very small part of one particular domain is, I believe, suspicious. This cannot be what we should be heading for in OT.

Apart from this specific point of seeming redundancy, we should be hesitant, in any case, about the introduction of all these new constraints. It was already noted in part I (p. 55) that the "new framework [of OT] faces a slumbering danger in that too many new process-specific constraints, that are introduced almost at random, might seriously undermine the restrictiveness and economy of the theory." A new constraint should only be introduced when unavoidable. Let us see if it is.

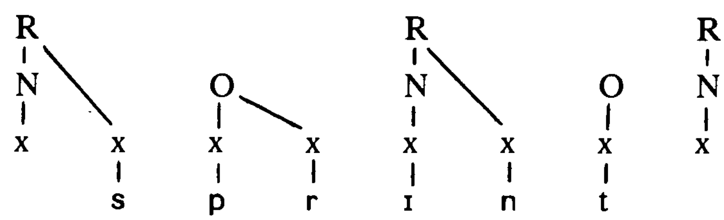
In the next section, I will return to some aspects of the framework discussed in §3.4, presented by Harris (1994). The Empty Nucleus Approach (ENA), in collaboration with OT, might offer a possibility to account for the data given above, without having to introduce a constraint that is new to OT.

§9.3.3 Empty Nuclei

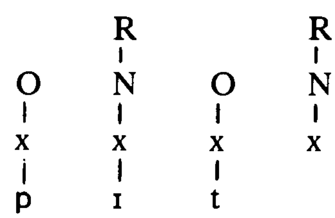
In §3.4 of part I, I discussed a theory in which it is possible to have nuclear positions that are empty. This opens the door to onsets and codas that are 'filled', but which do not form a part of a full phonetically interpreted syllable. For a more elaborate discussion of this framework, I refer to §3.4 and to Harris (1994), but I will here recapitulate briefly the aspects that are most important to our present subject.

A syllable consists of three possible constituents: the onset, the rhyme and the nucleus. The rhyme is a projection of the nucleus. All constituents of the syllable have maximally two 'slots'. This is called the principle of maximal binarity. Now, recall that the syllabification of words such as *sprint* /sprint/ and *pit* /pit/, according to this line of thinking, is as follows:

(46) a.



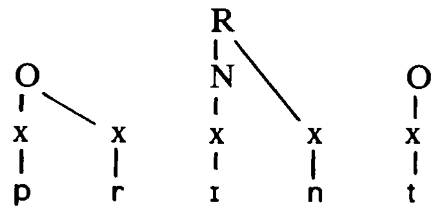
b.



We can see that /s/ in *sprint* belongs to a separate syllable, the nucleus of which is not phonetically interpreted. As I pointed out in §3.4 (p. 34), this is possible in English and Dutch, but not in, for example, Spanish, where nuclei apparently *do* have to be interpreted phonetically (comp. Spain (Eng.) /speɪn/, Spanje (Dutch) /spanyə/ vs. España (Span.) /españa/). There are thus two types of languages: those in which nuclear positions have to be filled with segments and in that way be phonetically interpreted, and those in which nuclear positions can be empty of segments.

I would propose that for a language of the former category, there are two strategies of avoiding empty nuclei. The first is to fill the nuclear position with a segment. This is what happens in, for example, Spanish, as noted above. The second, however, is to avoid the creation of the position itself. This can be done, in a word such as *sprint*, by deletion of initial /s/. Namely, the initial empty nuclear position in *sprint* becomes obligatory, because /s/ has to be licensed as the coda of a syllable, since it cannot form a part of the same onset as /pr/. Deletion of /s/ will result in a perfecly well-formed onset /pr/, without an initial syllable with an empty nucleus.

(47) *ENU representation of /print/*[31]



We are able to account for all the data in (40), if we assume that Sranan is a language that adopts this second strategy, deleting segments that can only exist in their place through licensing by an empty structural position. English, of course, is a language, and was so in the 17th century, that *does* allow empty positions. This difference accounts for the assymetry between English 'input' strings and Sranan 'output' strings (or should I say *trings*?).

An adaptation of the whole of the ENA, including all the licensing constraints and templatic specifics, to the framework of OT would go way beyond the scope of this thesis, though it is not too hard to imagine. Below, I will show that for an adequate representation of the assymetry between English and Sranan onsets, a relatively high ranking of the already widely accepted constraint *CODA (NO-CODA, see §6) suffices. That is, of course, if we accept that onsets can contain no more than two segments (as, indeed, all other constituents), and that the sonority value of a possible second onset segment cannot be lower than that of the first segment.[32]

(48) a. *ENA & OT representation of spoil → [pori]*

constraints / candidates	ONS	*COD	H-ONS	PARSE SEGMENT
s.p ó.ri		*!		
s <p> ó.ri			/s/!	*
☞ <s>.p ó.ri			/p/	*
<s>.<p> ó.ri	*!			* *

[31]Note that /prɪnt/, in this approach, still has a syllable with an empty nucleus, of which /t/ forms the onset. However, in the next parapgraph, dealing with the rhyme of the Sranan syllable, I will return to this, and we will see that Sranan does not allow this position to exist either.

[32]This rules out candidate *spó.ri*, which is impossible in the ENA, and would always be syllabified as *s.pó.ri*, creating an empty nuclear position and a violation of *CODA.

b. *ENA & OT representation of square* → *[kweri]*

constraints / candidates	ONS	*COD	H-ONS	PARSE SEGMENT
s. k w e.ri		*!		
s(.)<k> w e.ri		(*!)	/s/!	*
☞ <s>.k w e.ri			/k/	*
s.k <w> e.ri		*!		*
s <k><w> e.ri			/s/!	* *
<s>.k <w> e.ri			/k/	* *!
<s><k> w e.ri			/w/!	* *
<s><k><w> e.ri	*!			* * *

The explanation for the brackets around the violation mark of [sweri] is the same as that for the representation of [sweri] in tableau (44). The only certainty about the ranking of the constraints that can be given here, is that *CODA should be higher up the hierarchy than PARSE SEGMENT. If it is not, there is no reason why candidate [kweri], which only violates PARSE once, should win over [skweri], which only violates *CODA once. From this example, we are unable to tell where ONS and H-NUC should be ranked.

In this way, we are able to account for the Sranan data very elegantly, without the introduction of a constraint that is new to OT. Admittedly, the combination of the ENA, including binary branching within constituents and the possibility for some languages to have empty structural positions, involves adjustments. Adjustments which I will not work out here, but which, I believe, are perfectly well possible.

The high ranking of *CODA should remind us of the similar ranking of this constraint in Child Language, which was discussed in §6 of part I. Again, the line of approach opted for in that paragraph, dealing with CL in First Language Acquisition, was different from the one taken here, as it did not include the ENA in the OT-framework. Recall also that Schane's (1994) suprasegmental representation (§5.2) did *not* have structured syllables, while these do seem to be necessary in the present proposal. Nevertheless, the two approaches are not complementary in such a way that they exclude one another, i.e. the approach taken in §6 does not exclude incorporation of binary branching and the possibility for languages to have empty nuclei.

Furthermore, note that, although *COMPLEX ONSET was proposed to be prominently ranked during First Language Acquisition in §6 of Part I, it does not play a part in the present discussion of CR. Complex onsets as such did not seem to pose a big problem during the formation of Sranan. Perhaps only in the very first stages, as suggested by Smith (1987: 230) and discussed above in §9.2 and §9.3. In fact, the account given above comes closer to the account of CL in §6. We may, therefore, have to cast a fresh, critical eye on the preliminary conclusions drawn from the Child Language data of Part I. To be able to show the strong bond there seems to be between First Language Acquisition and Creolization within one theory is, of course, a noble objective.

The account for the fact that later Sranan does allow loanwords to have 'sCC-onsets' (which we now claim to be actually two syllables) runs parallel to that given in §9.3.1. Either because of the influence of English and Dutch, or because of a language-internal process of complexification for the sake of variety, *CODA has lowered in the hierarchy, to a ranking at least below PARSE-SEGMENT.

Obviously, the high ranking of *COD in Sranan would not only affect the onsets of syllables; it would have a far greater influence on rhymes. In the next paragraph, I will discuss other Sranan data and see how the analysis of these data (of Sranan rhymes) can be united with the analysis of 'word-initial reduction' presented here, where *COD is highly ranked in the constraint hierarchy of Sranan.

§9.4 Sranan Rhymes

Before I go on with this section, I must say that it is not so much the description of Sranan rhymes that will cause us a lot of brain toil; it is fairly straightforward. The phonological representation and the explanation of how this structure came about, however, do pose a number of difficult problems, which I will not be able to provide totally satisfying solutions for. I am therefore forced to limit myself to making some suggestions and following some lines of thought on what may lie behind the structures discussed on the following pages.

Leaving the ENA aside, for a moment, Sranan does not allow codas in its syllables. The only non-vowels that may close a syllable are nasals and glides (cf. [spuŋ] (spoon) and [prej] (to play), respectively): highly sonorous consonants.[33] In the syllable model based on Cairns & Feinstein (1982), repeated in (39), these are the only cononants possible to be parsed in the nuclear satellite position, i.e. outside the coda. It is only logical to assume a connection between their high degree of sonority, their special status in the Cairns & Feinstein (1982) model, and their special status in Sranan rhymes. These typical 'satellite consonants' in Sranan may be preceded either by a long vowel or by a short vowel.

The 'vowel inventory' of Sranan contains no diphthongs. The language does allow sequences such as [alejsi] (rice), [ɑjti] (eight) and [bɔj] (boy), but these are generally not considered to be diphthongs. Rather, they are vowel-glide sequences.

If a syllable-closing nasal does not receive its place features from a following onset, as the nasal in [wɪn.ti] (wind) does, it will be the velar nasal /ŋ/, as in [spuŋ] (spoon). However noteworthy, I will not go into this matter here, as this thesis is not so much concerned with the segmental domain as it is with the levels that lie above it.[34]

§9.4.1 'Final' consonants

Smith (1987), among others, points out that the basically open syllable structure of Sranan may well be caused by substrate influence. In fact, he names two specific substrates to have been the cause of the phonological structure of the creole:

> "We differ from a number of other researchers in that we do not regard the basic final open syllable structure typical of the Surinam creoles to have once been typical of all forms of English-based creole in the Atlantic area (eg. Alleyne, 1980), but to have been a pattern imposed on the form of West African Pidgin English (WAPE) brought to Surinam (and expanded there and/or in Barbados etc. with elements of colonial standard English) in conformity with the patterns of the two languages assumed to have been spoken by the majority of the slaves - Gbe and Kikongo - neither of which admits final consonants." (Smith 1987: 9-10)

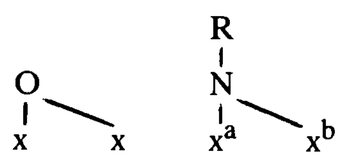
[33]Only in my own data, taken from someone who has been living in the Netherlands for more than 20 years now, did I find one example of /r/, a liquid, in coda position: [ferfi] (to paint). This may be seen as an indication that English and Dutch influence has made, or is making coda-positions less marked in Sranan. For the rest, I will ignore this exception.

[34]It is interesting to note that Steven, the child providing the data for part I of this thesis, has also been observed to pronounce Dutch banaan /banan/ as [nɑŋ] (Gilbers, p.c.).

This is an example of such a typical assumption in the field of creolistics that is just as hard to verify as it is to contradict. Open syllable structure (CV), namely, has long been known to be the least marked syllable structure. One such as Bickerton, therefore, would probably claim that this open syllable structure in the Surinam creoles was a result of this underlying unmarked UG-parameter - the simplest option. This dilemma will have to remain unresolved here.

In line of what was proposed in §9.3.3, then, let me make a rough sketch of what Sranan syllable structure might look like. I regard the representation in (50), then, as a sort of template.

(50) *Sranan maximal syllable structure*



x^a may be a long vowel or a short vowel
x^b is subcategorized for nasals and glides

As we can see, the rhyme node does not branch. If it did, codas would be possible. In the ENA framework, on which this representation is based (cf. §3.4 and §9.3.3), these coda's would have to be licensed by a following onset, which in turn would have to be lisenced by a phonetically interpreted or not phonetically interpreted nucleur position. This is not the case in Sranan. As we have seen in §9.3.3, the absence of the coda may also be expressed by the constraint *CODA.

Note that diphthongs, in figure (50), are not possible, because of the smallprint conditions on the two nuclear positions. These smallprint conditions are quite essential, although I acknowledge their seeming randomness in the theory as it is presented here; they should not be conditions, or rules, but rather the result of structural representation, or of more general constraints in the framework of OT. This is an unfortunate loose end, which will have to be tied to some other end in the future.[35]

[35] Again, however, the absence of diphthongs in Sranan may be expressed by the constraint *DIPHTHONG, introduced in §6 of Part I and shown there to play an important role in First Language Acquisition. Also, if length is represented, or rather caused by the number of moras attached to the segmental position, instead of the number of positions, the state of affairs as described in figure (50) is not so strange after all. A diphthong naturally occupies two segmental positions, while a long vowel can be represented as occupying only one position on the segmental tier.

'Long' vowels are represented here as occupying only one position on the segmental level. This is in line with our analysis of syllable structure in part I, based on Schane (1994) (Part I, §5.2 & §6). In his analysis, a long segment occupies *one* segmental position, while it is bound by *two* moras. Schane (1994) does not incorporate any further structure between the segmental level and the syllable nodes. We do.[36]

Now, let us take a look at some data and see how these can be analysed in a combination of the ENA and OT. The data are based on examples from Smith (1987). The phonetic transcriptions, however, are my own and based on my own interview with a Sranan speaker. This is partly for the reason that it is often unclear whether some writers (even phonologists) in creolistics are using phonetic script or written Sranan, which has only recently been standardized. To avoid misunderstandings about the actual pronunciation of Sranan, therefore, I have gathered some data myself.

(51) *English and Dutch rhymes vs. Sranan rhymes*

English		**Sranan**
bite	[baɪt]	[beti]
wind	[wɪnd]	[wɪnti]*
paint	[pent]	[peni]
scratch	[skrætʃ]	[krasi]
blind	[blaɪnd]	[breni]
eight	[eɪt]	[ɑjti]
thrust	[θrʌst]	[trusu]
proud	[praʊd]	[prodo]
skin	[skɪn]	[skiŋ]
stink	[stɪŋk]	[tiŋi]
squeeze	[skwiːz]	[kwɪnsi]
together	[təgeðə(r)]	[tigɛdrɛ]
sour	[saʊə(r)]	[swʊɑ]
like	[laɪk]	[lɪki]

*This pronunciation may have its origin in Dutch

[36]In personal communication, Harris has pointed out that the analysis presented in part I, based on Schane (1994) and following Gilbers & Den Ouden (1994) already suffers somewhat from over-structure. Segments are attached to moras *and* syllable nodes (cf. §5.2, (32)) on different levels. I do agree, but still believe that it is better (and closer to reality?) to have a lot of structure in representation, than to need rules, or a large number of specific constraints. For solutions to linguistic problems, therefore, we should first look at representation and then, perhaps, at extra-representational constraints. Of course, if one should totally disagree with this, there lies the task of expressing the structure presented in (50) in an OT constraint hierarchy. Quite an adventure.

Dutch			**Sranan**
samen (malkander)	[malkandər]	'together'	[makandra]
veter	[fetər]	'shoe-lace'	[fetrɛ]
rijst	[rɛɪst]	'rice'	[alejsi]
dweilen	[dʋɛɪlən]	'to mop'	[dʋejri]

What we find in these data, if we consider English and Dutch to be the input for Sranan, which is then the output, are a number of processes. Some examples:

(52)				
	- Cluster Reduction	[skr-]	→	[kr-]
		[rɛɪst]	→	[alejsi]
	- Segmental Simplification (changing a segment for a less marked segment)	[θ]	→	[t-]
	- Vowel Epenthesis	[baɪt]	→	[beti]
	- Nasalisation	[skwi:z]	→	[kwɪnsi]
	- (Compensatory) Lengthening	[blaɪnd]	→	[breni]
	- Vowel Harmony	[praʊd]	→	[prodo]
	- Flopping	[-ðər]	→	[-drɛ]
	- Weight Reduction (?)	[laɪk]	→	[lɪki]
	- Vowel Shortening	[fetər]	→	[fetrɛ]

CR in Sranan onsets was discussed in §9.3, where it was, in fact, shown not to be CR at all, but rather something that should be called Coda Deletion. For the sake of clarity, however, I will call the process /s/-CR. Segmental Simplification, Nasalisation, Vowel Harmony and other such segmental processes fall outside the scope of this thesis. What I will do below is endeavour to unite the analysis of /s/-CR with an analysis of the suprasegmental processes found in the data in (51).

Recall that there were two strategies adopted by languages to avoid empty nuclei. The nuclei can be filled, or the segments that 'create' the empty nuclei can be deleted, or rather avoided, since these segments will not be there in the first place in such languages. In the previous paragraph, on onset reduction, the constraint *CODA sufficed to account for this reduction within the frameworks of the ENA and OT. It is tempting to go on to say that *CODA is also responsible for the deletion and avoidance of word-final consonants in Sranan. Nevertheless, I carefully write "word-final consonants", because these segments are, of course, not considered to be codas in the ENA! If we stick to this approach, rather than take only a very small slice of it, we should acknowledge that word-final consonants such as /t/ in [baɪt], are actually *onsets*, licensed by an empty nucleus (cf. the representation of /pɪt/ in figure (46)).

Back at the drawing table, then, the conclusion must be that the cause of the deletion lies not only in unwelcome codas, but more fundamentally in the impossibility of empty nuclei in Sranan. I will express this in a constraint that will be part of the widely accepted family of FILL, one of the faithfulness constraints (cf. §6 and Prince & Smolensky 1993: 25):

(53) FILL NUC nuclei are filled with segmental material

In the OT-tableaux given in §9.3.3 to account for 'onset reduction', *CODA can be replaced without further relevant side-effects by FILL NUC.

For the example [baɪt] → [beti], then, the relevant OT-tableau is given in (54). I will not be concerned here with the vowel change and the un-diphthongization, so those processes are not expressed in this tableau. According to this analysis, they have no direct relation to the vowel epenthesis this tableau is meant to account for. The symbol '⌂' represents empty structural positions.[37]

(54) *OT & ENA account of epenthesis in [baɪt] → [beti]*

constraints / candidates	FILL NUC	PARSE SEGMENT
b a i.t ⌂	*!	
b a i <t>		*!
☞ b a i.t i		

The following tableau in (55) shows an attempt to come to an account of a specific word-final cluster reduction with the help of the constraint FILL NUC. Does it work?:

[37]Prince & Smolensky (1993: 26) show a tableau accounting for C-epenthesis in the Arabic output *ʔalqalamu* from the input /al-qalamu/. The glottal stop /ʔ/ is the direct result of the violation of ONS by al.qa.la.mu and the violation of lower-ranked FILL by ⌂al.qa.la.mu. Because FILL is ranked lower than ONS, the best candidate is ⌂al.qa.la.mu, but the empty position *automatically* results in the insertion of a default consonant: /ʔ/. However, in the framework we are presently working in, empty positions are quite well possible and do therefore not automatically result in epenthesis of default segments. In tableau (54) I have thus given the form with epenthetic /ɪ/ its own place in the set of candidates, where it is competing with both *bai.t⌂* and *bai<t>*.

(55) *OT & ENA account of /t/ deletion and epenthesis in [rɛɪst] → [alejsi]*

constraints / candidates	FILL NUC	*COD	PARSE SEGMENT	H-ONS
a.lejs.t Δ	*!	*		
a.lej.s <t> Δ	*!		*	/s/!
☞ a.lej<s>.ti			*	/t/
a.lej.s<t>i			*	/s/!
a.lejs.ti		*!		
a.lej<s>.<t>			* *	

It obviously does not. The 'wrong' candidate wins here, because of the constraint H-ONS, which makes /t/ a better onset than /s/, /t/ being the least sonorous. Recall that, after the tableau in (48), *CODA should be ranked higher than PARSE SEGMENT. It is important to stress that FILL NUC does not make *CODA redundant. Without the latter constraint, the best output candidate would be [a.lejs.ti].

I can only make a suggestion as to why, in reality, candidate [alejsi] formed the output, instead of [alejti]. My suggestion is that the process occurs in steps. The initial creator of the empty nuclear position is the onset /t/. It is no use filling the nucleus now, as /s/ would still have to be deleted, because it violates *CODA. /t/ is therefore deleted, at the cost of a violation of PARSE SEGMENT. Segment /s/ remains, but cannot occur in that position either, because there is no coda-position and /s/ also needs the license of an empty nucleus. Rather than violate PARSE again, this nucleus is filled with segmental material, following the constraint FILL NUC. Without this explanation, I know not what may have caused the rendering of the wrong output in tableau (55). I do recognize, however, that there is fierce discussion at present about the possibility to incorporate some sort of 'cyclicity' in the framework of OT, as it seems to go against the principles the framework is based on. I will leave the question for now.

In the following tableau (56), I will show how 'segment flopping' can be accounted for with the tools we are now using.

(56) *OT & ENA representation of flopping in [təgɛðər] → [tigɛdrɛ]*[38]

constraints / candidates	FILL NUC	*COD	PARSE SEGMENT
ti.ge.de.r ⌂	*!		
ti.ge.de.<r>			*
☞ ti.ge.dre			
ti.ge.der.⌂ ⌂	*	*	

In the last candidate, the last syllable consists of two empty positions. The first is the onset that should license coda /r/, while the other is the nucleus that should, in turn, licence the onset position.

In this paragraph, I have presented a relation between word-initial reduction, or /s/-CR, coda-deletion and word-final epenthesis. To strengthen this relation, I wish to draw the attention to Japanese. In this language, no complex onsets are allowed, and neither are codas. Only nasals may occupy a position after the nucleus in the same syllable. See, for example, the Japanese version of the Dutch loanword *glas* (glass) /χlɑs/, → /ga.ra.su/. This example can be accounted for by a high ranking of *COMPLEX ONSET and of *CODA.

In faster speech, [garasu] may be pronounced [garas]. Vowels which can be left out like this are called "voiceless vocals".[39] This points to a somewhat lower ranking of FILL NUC and a syllabification of the word as ga.ra.s⌂, where FILL NUC is violated. The syllable structure of Japanese is highly unmarked, which makes the observed parallel with the creole Sranan even more interesting, from the point of view of creolistics (cf. the discussion in §8.1 and §8.2).

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[38]Another possible candidate, ti.ge.de.re, will have to lose this competition somehow, because the epenthetic vowel (schwa) yields a new syllable node, or a mora, which can be avoided by deleting in turn, the vowel in *de*, resulting in optimal ti.ge.dre. This, again, does seem to point in the direction of 'cyclicity' in the derivation. However, although I believe that the origin of the process lies here, I have not been able to establish the precise constraint bringing it about.

[39]De Graaf, p.c.

§9.4.2 Undiphthongization

As far as diphthongs are concerned, the Sranan data in (51) show two ways in which they are eliminated. In many words, such as *bite* [baɪt] → [beti], the English or Dutch diphtong is 'replaced' by a long vowel, which is not necessarily a lengthening of one of the parts of the replaced diphthong. The second possibility is that there remains a short vowel in place of the diphthong, as in *like* [laɪk] → [lɪki]. It will thus be clear that there has to be more than one analysis of 'undiphthongization' in Sranan.

In the sketch of Sranan syllable structure in figure (50), we can see that diphthongs are indeed impossible here, due to the subcategorization of the two nuclear positions: the first may only contain (short or long) vowels, while the second may only contain nasals or glides. Translating this to the OT-framework, it is obvious that the constraint *DIPHTHONG, introduced in §6, has an important role to play here. The subcategorization of specific positions, if necessary, cannot be expressed by constraints referring to specific segments, but only by constraints referring to sonority values (comp. H-NUC and H-ONS, §6).

In the following example, I will ignore the constraints to have caused the epenthetic vowel in [beti]. I shall only be concerned with the undiphtongization of the input [baɪt]. In §6, when we were discussing CL in First Language Acquisition, a tableau was presented in (35b), showing how deletion of the second part of a diphtong could lead to lengthening of the first part. "The purpose of CL [...] is to preserve the bimoraicity of trochaic feet (μ'μ)" (§5.2: 53). (35b) is repeated here as (57). For its precise explanation, I refer to §5.2 and §6.

(57) *First Language Acquistion CL in geit [χeɪt] → [χɛ:t]*

constraints / candidates	BIN FEET	HEAVY TROCH	FILL MORA	*CODA	*DIPH-THONG	PARSE SEG	*FINAL C-MORA
g e i t (μ' μ)				*!	*		
g e i t μ μ	*	vac		*!	*		
☞ g e <i> t (μ' μ)				*		*	
g e <i> t (μ'<μ>)			*	* !		*	
g e <i> t (μ' μ)				*		*	*!
g e i t (μ μ')		*		*!	*		

In the present analysis, of course, *CODA would not be violated by /t/ in [χeɪt], but that makes no great difference to the tableau above. Also, *FINAL C-μ is no longer appropriate, as final C's are not really final anyway; they are onsets and onsets never receive moras. If a similar constraint turns out to be necessary after all, it may be replaced by a constraint such as *E-NUC-μ, expressing that no moras can be associated to empty nucleï. I will return to this constraint in §10, below, where it will indeed prove to be quite vital to our analysis.

Now, let us see how undiphtongization in Sranan is accounted for with these constraints. Unfortunately, I am unable to account for the fact that the long vowel in place of the diphthong is /e/, as opposed to any other vowel.[40] The tableau will therefore only deal with the preservation of weight. For this reason, I will use the symbol 'V' (vowel) for the possible short counterpart of the replacing vowel /e/, while this long vowel will be expressed by 'V:'. In English, of course, it *is* possible to have a short vowel (i.e. the second half of a diphthong) in the nuclear satellite position.

[40]However, the change resembles, for example, the change from Old Dutch [χraɪp] (grip) to Modern Dutch [χrep] (Gilbers, p.c.). Old Dutch /au/ also often changed to /o/ in Modern Dutch, while this also happened in the genesis of Sranan, e.g. English *proud* /praud/ → /prodo/.

(58) *Undiphthongization in [baɪt] → [beti]*

constraints / candidates	BIN FEET	HEAVY TROCH	FILL MORA	*CODA	*DIPH-THONG	PARSE SEG
b a i .ti (μ' μ)					*	
b a i .ti μ μ	*	vac			*	
☞ b V: <V>.ti (μ' μ)						*
b V <V>.ti (μ'<μ>)			*			*
b V <V> t* (μ' μ)				*		*
b a i .ti (μ μ')		*			*	

*This candidate would also violate FILL NUC, as the coda /t/ would need the license of a following nucleus, via an onset.

We can see that replacement of the diphthong by a long vowel is a good option. Another option would be to replace the second part of the diphthong by a segment that *is* allowed to occupy the nuclear satellite position in Sranan: a nasal or a glide. This would avoid the violation of PARSE SEGMENT. I suggest that this is what happened in the alterations of words such as *squeeze* [skwi:z] and *rice* [reɪst] into into [kwinsI] and [alejsi], respectively.

If we take moraic preservation to be a fundamental principle in the account of CL and comparable processes, it is much harder to account for the vowel shortening in *like* [laɪk] → [lɪki] and *shoe-lace* [fetər] → [fɛtre]. It seems wrong to argue that the bimoraicity of the trochaic feet is already preserved by the epenthetic nucleus which follows the original input, because this epenthetic nucleus is also attached in words such as [baɪt] → [beti]. Here dangles another loose end.

§9.5 Conclusion, or: "Which ranking reigns?"

The conclusion of this section, then, must be that it is possible to use only a small number of constraints, such as *CODA, *DIPHTHONG, PARSE SEGMENT and FILL NUCLEUS, to account for the syllable structure of Sranan. What is *not* possible, however, is to give one ranking which can account for the specific strategies that are opted for in Sranan to achieve the 'correct' syllable structure. At the time of writing (in fact, on the day of writing!), there is still debate on optionality and rerankings in OT. See, for example the following quote from the Optimality List:

> I am convinced that some notion of unmarked ranking is required, as well as one of reranking 'on the fly'. I am also sceptical of multiple grammars as the appropriate metaphor for thinking about optionality, especially the kind I am interested in--what used to be called 'sloppy speech'. (G. S. Nathan, Optimal., 12 July 1995)

This reranking may well have occurred during different stages in the development of the creole Sranan. Among others, Eersel (p.c.) has pointed out to me that new input words to Sranan, or loanwords if one wishes, were treated differently and led to different outputs in different stages of the development of the language. Going back to the suggestion by Smith (1987:230) that Sranan probably started out with only simple onsets, and the following brief discussion of this claim in §9.2 and §9.3, this would also count for *COMPLEX ONSET. This constraint does not play a part in later Sranan, but it probably did in early Sranan, as it does in First Language Acquisition (cf. §6).

This is also the place to return to my suggestion in §8.1, that unstable rankings of, for example a child acquiring its mother tongue, or a language in the process of development, might be comparable to *'loaded dice'*. From this point of view, ranking is not random, or simply absent. Ranking exists, but it is not so strict, and with an *inclination* towards a certain default, or less marked ranking. Rankings, then, which are only distinguished by small differences, will have effects such as the ones described above. In most words, for example, empty nuclei will be filled with segmental material, and in others, the nuclear positions will be deleted. In others, even, the empty nucleus will be allowed to remain; the dice do not always do what they have to do, even if they are loaded.

§10 Classical CL and the ENA

The observing reader will have noticed that, on the previous pages, I have ignored the effects of the analysis of Sranan syllable structure for the account of 'Classical CL' (cf. §4.2) as found in data of First Language Acquisition. An example of this type of CL is Steven's realization of Dutch *bal* (ball) [bɑl] → [ba:]. The reason for this lacuna is that the adaptation of the analysis presented in §6 to account for Classical CL to the analysis that is presently proposed, deserves some special attention.

(59) repeats the OT-account of the relevant type of CL that was proposed in §6, figure (35).

(59) *OT-account of CL in bal → ba:*

constraints / candidates	BIN FEET	HEAVY TROCH	FILL MORA	*CODA	PARSE SEG	*FINAL C-MORA
b a l (μ'μ)				*!		*
b a l μ μ	*!	vac		*		*
☞ b a<l> (μ'μ)					*	
b a<l> (μ'<μ>)			*!		*	
b a l (μ μ')		*!		*		*

In this tableau, deletion of /l/ is forced by the constraint *CODA. /ɑ/ is then lengthened to /a/ in order to preserve the bimoraicity of the trochaic foot. Yet, in the present analysis, i.e. the combination of OT and the ENA, *bal* would be syllabified as *ba.l*△, leaving *CODA without influence to the process. How can this type of CL by explained within the ENA?

Harris (p.c.) provides an answer to the question why /ɑ/ lengthens after deletion of /l/:

> There are [...] languages where something like this does happen, i.e. CVC → CVV. In many of these cases, there's a minimal word constraint which says that a word can be no less long than two 'morae'. In terms of the empty nucleus approach, this is translated as: the word must contain a nuclear licensing domain (i.e. a minimum of two nuclear positions). <See, city> and <pit△> each have two nuclear positions; the impossible English word *[sɪ] has only one. (Harris, p.c., August 28, 1994)

If we only adopt a minimum of two nuclear positions, or moras, then what should we do with *geit* (goat) [χeɪt] → [χɛ:t]? Namely, this word will still contain two nuclear positions if /ɪ/ is deleted: [χɛ.t△]. The minimum of two nuclear positions does clearly not suffice to account for all the data. Therefore, I suggest that, next to the minimum of two nuclear positions or, rather, moras (necessary to account for the ill-formedness of *[sɪ]), there is a further constraint, similar in effect to *FINAL C-μ (cf. §6). This constraint will be *E-NUC-μ, already briefly introduced in §9.4.2.

(60) *EMPTY-NUC-μ do not associate a mora to an empty nuclear position

This constraint, then, will be high up the hierarchy of Child Language, yielding the following tableau for [χeɪt] → [χɛ:t]:

(61) *[χeɪt] → [χɛ:t] with *E-NUC-μ*

constraints / candidates	BIN FEET	HEAVY TROCH	FILL MORA	*CODA	*DIPH-THONG	PARSE SEG	*E-NUC-MORA
g e i .t △ (μ' μ)					*		
g e i .t △ μ μ	*	vac			*		
☞ g e <i>.t △ (μ' μ)						*	
g e <i>.t △ (μ'<μ>)			*			*	
g e <i>.t △ (μ' μ)						*	*!
g e i .t △ (μ μ')		*			*		

With the help of *E-NUC-μ, the reason why candidate number 5 is not an optimal candidate, is the same as the reason why /ɑ/ in /bɑ.l/ lengthens to [a]. The reason why /l/ is deleted in Child Language *bal* can be sought in one of the above-mentioned strategies to avoid the violation of FILL-NUC, i.e. to delete the nucleus and the segment it has to license.

(62) *bal → ba:*

constraints candidates	BIN FEET	HEAVY TROCH	FILL MORA	FILL NUC	PARSE SEG	*E-NUC MORA
b a . l ⌂ (μ' μ)				*!		*
b a . l ⌂ μ μ	*!	vac		*		*
☞ b a <l> (μ'μ)					*	
b a <l> (μ' <μ>)			*!		*	
b a .l ⌂ (μ μ')		*!		*		*
b a . l ⌂ (μ'μ)				*!		

The last candidate, /ba:l/, loses, because it violates FILL-NUC. The reason why the influence of this constraint is apparently less strong in *geit*, which should otherwise become [χɛ:] or [χe:], remains unclear. Just as unclear as the same discrepancy in §6, p. 57, where *geit* was allowed to violate *CODA, while this constraint was precisely the origin of the deletion of /l/ in *bal*.

In this section, thus, I have presented a possible account of CL in First Language Acquisition within the rules of the analysis I proposed for Sranan syllable structure in §9. I will be the first to recognize (and then try to bury) a number of loose ends, but the analysis still shows a strong relation between CL in First Language Acquisition, /s/-CR and Undiphthongization in the development of Sranan. In this way, the relation between First Language Acquisition and Creolization, which is only logical to exist, is strengthened, though not proven, as pointed out in the following and concluding paragraph.

§11 Conclusion to Parts I & II

In this work, I have explored the relation between First Language Acquisition and Creolization with regard to syllable structure. In part I, I was mostly concerned with the analysis of direction of syllabification in various phonological models. Different analyses were tested against Child Language data. These data exhibited the processes of Cluster Reduction and Compensatory Lengthening, the combination of which proved to be problematic for a number of analyses of syllabification and syllable structure. In the end, the conclusion of Part I was that Optimality Theory provided the best solution to the problem of direction of syllabification, as this problem is 'circumvented' in this theory, where constraints such as PARSE and FILL work happily alongside one another.

One loose end that was left in Part I was the analysis of /s/-Cluster Reduction in First Language Acquisition, as it was recognized that this would lead us into quite a different analysis. This loose end was picked up en waved about in Part II, which deals with data from a Surinam creole, Sranan. When compared to its superstrate language, English, Sranan shows a number of deletions of initial /s/ in clusters. Therefore, this was what my attention has focussed on in the latter part of this thesis.

Following the principle of trial and error, then, I have attempted to provide satisfactory analyses of both onset- and rhyme-structure in Sranan, unified within the framework of OT, which, after all, proved highly capable in Part I. The main goal of this enterprise, was not only to give an anlysis of the syllable structure of Sranan, but to unify this analysis with an analysis of CR and CL (i.e. syllable structure) in First Language Acquisition, in order to show the strong bond between First Language Acquisition and Creolization.

It turned out that, in order to achieve these goals, it was best to return to an analysis that was only briefly discussed in Part I (§3.4), viz. the Empty Nucleus Approach. With a combination of Optimality Theory and the Empty Nucleus Approach, finally, I was able to give the most general account of the processes described and inventoried in this thesis.

It must be said that in this case, unfortunately, a strong bond between the creole Sranan and data of First Language Acquisition has not been proven beyond doubt. This is for the simple reason that at least some of the substrate languages for Sranan, appear to have similar syllable structures. Therefore, the Substratist Creolist will say that this latter fact is the cause of the specific, highly unmarked, syllable structure of Sranan, while the Universalist Creolist will claim that Sranan syllable structure must mirror universal unmarked default settings for syllable structure (cf. §8.2). It is also still possible to stick to the middle way, discussed in §8.2, claiming that the substrate structure was 'copied' by Sranan, because it was the most unmarked structure it encountered. Ah well...

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